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Issue focus:
Mill maintenance

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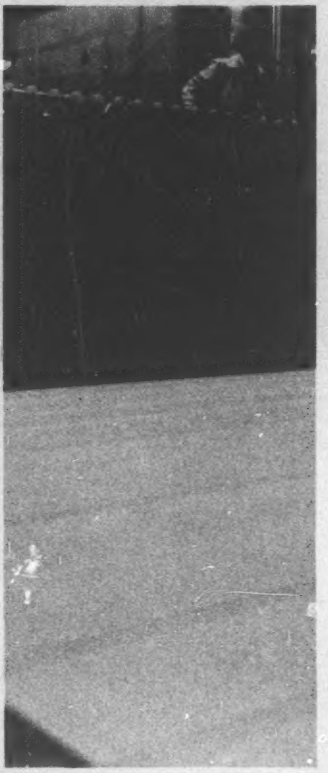
RESTRUCTURING MAINTENANCE 59



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COVER: *Two 10-roll, 2500-fpm supercalenders located in a pit below the operating floor of St. Regis' new LWC paper machine at Sartell, Minn. (feature story on this expansion begins on page 82). Photo courtesy of St. Regis.*

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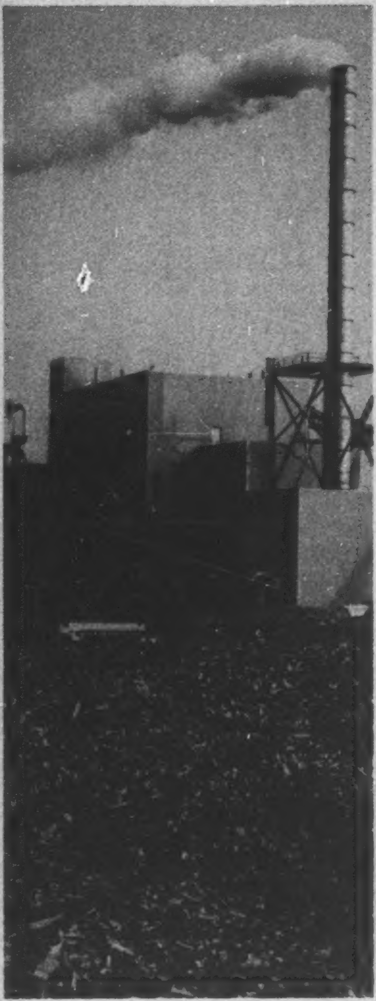

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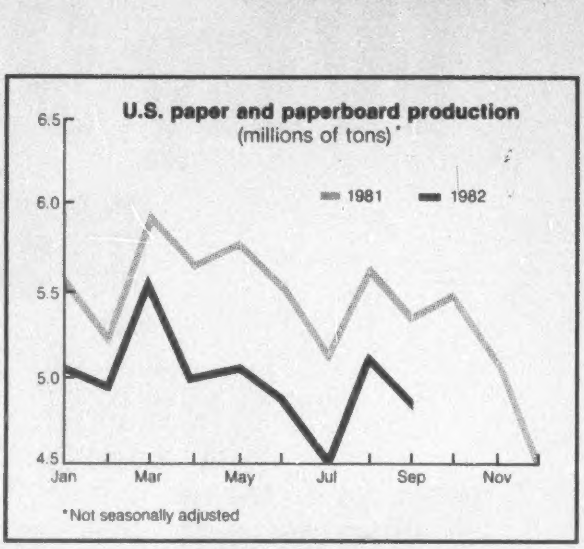
MONTH IN STATISTICS

U.S. paper and paperboard production in September totaled 4.8 million short tons, 6.2% below the September 1981 total, according to the American Paper Institute. The trend of production, as measured by the two-month moving average of the seasonally adjusted data, moved above the 5-million-ton level in September for the first time since March. However, total output for the first nine months of the year was 5.7% below year ago.

Among major grades, newsprint production is continuing to slow, reflecting reduciton in inventories at publishers. Uncoated groundwood production in September gained strength and was up 9.0% over year-earlier levels, while shipments of coated paper and uncoated free sheet dropped below last year's levels. In paperboard, September production was down substantially in all major grades, although production of unbleached kraft linerboard for export was up 20% over year-earlier levels.

Total Canadian newsprint shipments in September came to 601,000 metric tons, down 15.2% from September 1981, according to the Canadian Pulp & Paper Assn. Newsprint mill operating rates plummeted to 60% in September from 75% in August, and were well below the 83% rate of a year earlier.



		Latest month (000 short tons)	% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION[1]					
Newsprint	September	386	−12.5	5,089	−2.8
Uncoated groundwood (s)	September	121	9.0	1,425	−2.5
Coated paper (s)	September	422	−2.8	4,990	0.8
Uncoated free sheet (s)	September	627	−5.4	7,801	−2.6
Unbleached kraft packaging and industrial (s)	September	307	−3.8	3,654	−7.6
Tissue	September	345	−8.5	4,367	−3.6
Total paper	**September**	**2,444**	**−6.0**	**30,268**	**−3.3**
Kraft linerboard, unbleached	September	1,131	−6.7	13,703	−8.6
Semichemical medium	September	365	−4.9	4,407	−9.0
Bleached paperboard	September	286	−9.8	3,728	−7.0
Recycled paperboard	September	537	−8.2	6,664	−7.4
Total paperboard	**September**	**2,401**	**−6.6**	**29,579**	**−8.0**
Total paper and paperboard*	**September**	**4,846**	**−6.2**	**59,847**	**−5.7**
PULP, WASTEPAPER & FIBER[2]					
Total woodpulp production	August	4,226	−6.9	50,186	−5.3
Market pulp production	August	525	−9.6	5,874	−7.0
Wastepaper consumption at paper/board mills	August	1,188	−4.9	13,754	−3.7
Pulpwood consumption (cords)	September	6,758	−0.6	79,362	−1.7
CONVERTED PRODUCTS STATISTICS[3]					
Corrugated box shipments (billion ft^2)	September	20.657	−2.8	177.271†	−5.8
Containerboard inventories at box plants	Sept. 1	2,553	7.4		
INTERNATIONAL TRADE[2]					
U.S. paper imports (including products)	August	664	7.3	7,948	−4.7
Imports of Canadian newsprint	August	508	1.8	6,531†	−5.4
U.S. paper exports (including products)	August	335	−5.9	4,263	−12.9
Exports of unbleached kraft linerboard	September	154	20.3	1,922	−2.6
Exports of woodpulp	August	279	−7.0	3,491	−6.0
CANADIAN STATISTICS[4] (reported in metric tons)					
Total newsprint shipments	September	601	−15.2	5,952†	−9.2
Operating rates	September	69%	92%	83%	94%
Inventories held by U.S. consumers	Sept. 30	1,432	−1.9		
Woodpulp shipments (export only)	September	486	1.3	4,413†	−11.1
Operating rates	September	60%	83%	77%	86%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fiber Box Assn., Paperboard Packaging Council. 4. Canadian Pulp & Paper Assn.
*Includes construction and wet machine grades. †Not annualized. ‡Not directly comparable to year ago because of coding change. (s) = shipments.

FINANCE

U.S. paper profits still down in third quarter

U.S. paper industry profits continued to be hurt by weak domestic and international markets and general price erosion in the third quarter as the world recession showed no signs of easing. Downtime at pulp and paper mills was widespread, and most major U.S. paper companies reported both profits and revenues for the quarter below year-earlier levels. Despite gains from tax-rate adjustments and other accounting changes, paper industry profits fell 32% on a 6% decline in sales, according to a *P&P* survey of 28 firms.

For seven more firms with extensive forest-products holdings, the third-quarter earnings picture was worse: profits fell 61% while sales were off 4%. Earnings for the combined U.S. paper/forest products industry dropped 39%, and sales 5%.

IP profits plummet. "The dismal condition of the economy has made the third quarter a most difficult period for the forest products industry," said Edwin A. Gee, International Paper Co. chairman and CEO. IP reported profits of $32.4 million, 40% below a year ago, on sales of $986.2 million, down 23%.

"Specifically, high interest rates and the continuing recession in the U.S. and a strong dollar abroad have adversely affected industry operating rates which resulted in very competitive pricing in all of our product lines," Gee said.

Crown Zellerbach Corp. reported that third-quarter earnings improved slightly over 1981—rising 7%—but remained hurt by the recession and continuing losses by CZ Canada. Mead Corp. registered an operating loss of $20.1 million in the third quarter compared with profits of $22.8 million in third-quarter 1981. Mead also reported an extraordinary charge against earnings of $22.5 million from the $45-million settlement of its corrugated container antitrust case.

Wood products still declining. Companies more heavily involved in wood products were harder hit in the quarter, and many bolstered earnings through tax-rate adjustments or other accounting changes. Georgia-Pacific Corp. reported a loss of $1 million from operations for the third quarter, compared with income of $31 million in third-quarter 1981. However, an extraordinary gain of $27 million from an exchange of common shares for debt brought net income to $26 million.

Boise Cascade Corp.'s earnings tumbled 87% to $2.5 million, despite the fact that after-tax results were helped by a tax provision calculated for the nine months just ended. And Champion International Corp., whose profits were down 32% below year-ago, said results were aided by the sale of land in Texas and federal income tax accrual changes.

Canadian firms post losses. The worldwide recession continued to take its toll on Canadian financial statements in the third quarter, as most firms posted substantial losses for the period and revenues dipped below year-earlier levels, according to ten producers. Markets for newsprint and pulp continued to deteriorate, resulting in general pricing weakness, while wood products remained severely depressed.

The ten firms reported a combined operating loss of C$64.1 million compared with profits of $44.4 million last year, on sales of $2.3 billion, down 3.0% from year ago. Six firms operated in the red, including four major western firms who continue to be hard hit by virtually paralyzed wood products markets.

U.S. PAPER/FOREST PRODUCTS RESULTS

	Third quarter ($000)			
Paper companies	**Sales**	**Change 1982/81**	**Earnings[1]**	**Change 1982/81**
Chesapeake	$ 70,895	−19.0%	$2,678	−65.7%
Clevepak	44,346	48.2	950	−25.2
Consolidated	133,501	0.2	4,621[2]	−61.6
Crown Zellerbach	749,200	−5.2	7,400	7.2
Diamond	232,581	−8.0[3]	3,724	121.7[3]
Federal Paper	114,709	−3.3	2,739	−5.2
Fort Howard	150,948	16.4	24,932	9.2
Glatfelter	57,282	−20.7	4,294	5.8
GN Nekoosa	356,800	−5.0	17,400	−23.3
Hammermill	312,602	−0.2	5,969	−28.1
Int'l Paper	986,200	−22.5[4]	32,400	−40.0[4]
James River (7/25)[5]	262,363	47.4	6,466	53.3
Kimberly-Clark	741,700	3.9[3]	54,000[6]	9.8[3]
Longview (7/31)[5]	88,576	−13.4	(1,416)	n.m.
Mead	680,469	−10.5[3]	(20,161)[7]	n.m.
Mosinee	22,640	−0.9	1,031	−42.8
Pentair	65,772	18.3	2,611	18.0
Publishers	62,900	−21.4	(5,700)	n.m.
St. Regis	690,297	−2.5	50,365	16.5
Scott	574,272	−0.2	22,475	−17.4
Sonoco	132,732	1.2	6,790	−30.1
Sorg	18,459	−17.6	56	−90.4
SW Forest	162,160	−16.0	(6,422)	n.m.
Stone Container	104,878	2.9	2,023	−68.5
Union Camp	374,733	−13.0	28,747	−35.2
Wausau (8/31)[5]	44,317	−14.8	86	−93.4
Westvaco	351,960	−10.4	16,431	−35.3
Willamette	246,911	−1.2	8,059	115.3
Total	**7,834,203**	**−6.2**	**268,824**	**−31.7**
Forest products				
Boise Cascade	736,670	−5.7	2,490	−86.5
Champion Int'l	950,631	−5.8	16,607	−32.1
Georgia-Pacific	1,422,000	1.5	(1,000)	n.m.
Louis.-Pacific	228,300	−10.3	650	n.m.[8]
Pope & Talbot	66,147	24.8	1,451	n.m.[8]
Potlatch	212,733	−5.5	3,804	−42.3
Weyerhaeuser	1,024,323	−6.6	25,300	−49.5
Total	**4,640,804**	**−3.7**	**49,302**	**−61.3**
U.S. total	**12,475,007**	**−5.3**	**318,126**	**−39.0**

CANADIAN PAPER INDUSTRY RESULTS

Abitibi	C$388,265	−14.4	C$8,062	−76.0
B.C. Forest	185,300	43.8	(25,800)	n.m.
B.C. Resources	154,[illegible]	−8.3	(14,900)	n.m.
Con-Bathurst	339,900	−10.3	9,400	−66.4
CZ Canada	165,600	22.1	(10,200)	n.m.
Domtar	411,300	−13.2	(1,600)	n.m.
Fraser	101,300	−11.5	(2,242)	n.m.
Great Lakes	100,380	−28.9	936	−95.3[3]
Mac. Bloedel	427,000	19.1	(30,000)	n.m.
Scott	48,193	17.3	2,237	12.5
Total	**2,321,238**	**−3.0**	**(64,107)**	**n.m.**

1. Income after taxes, from continuing operations, excluding most significant nonrecurring items in both years.
2. Net income includes an after-tax charge of $6.2 million for plant closing.
3. 1981 figures restated by company.
4. Includes results of Canadian Int'l. Paper Co., sold in October 1981.
5. Period ended. Figures for James River are for first quarter, and reflect acquisition of American Can Co. on July 2, 1982. Wausau figures are for fourth quarter.
6. Includes gain of $8.3 million from sale of woodlands.
7. Net loss before additional $22.5-million charge from antitrust settlement.
8. Reported net loss in third-quarter 1981.

n.m. = not meaningful. (   ) = loss.

Folding box industry buying more recycled paperboard to cut costs

Clay-coated recycled boxboard, solid bleached sulfate market shares shift in recession—future trend or temporary result of low wastepaper costs?

By DEBRA A. ADAMS, Assistant News Editor

☐ Paperboard grades preferred by the folding carton industry appear to be changing, at least in the near-term, and some producers of solid bleached sulfate (SBS) and clay-coated recycled boxboard believe an emerging emphasis on economy vs elegance in packaging could cause a permanent shift in markets.

According to some market observers, in the last two years an ever-increasing number of companies have been switching packaging of their products to clay-coated "newsback,"—which is the leading secondary fiber-based paperboard grade used in the folding carton industry—from SBS, the industry's more popular virgin fiber paperboard grade.

This practice reverses an earlier trend that caused clay-coated recycled newsback to lose market share to solid bleached.

The change is attributed to a number of factors, which basically stem from a worldwide economic recession, combined with improvements made in clay-coated newsback quality, observers say.

Companies cut packaging costs. Since 1980, companies have come under increasing pressure to reduce costs to make their products more competitive. Where it has been possible to do so, they have cut packaging costs by downgrading to cheaper packaging.

For SBS users, the most viable alternative has been clay-coated recycled paperboard.

According to the Paperboard Packaging Council (PPC), clay-coated news accounted for 39% of total folding-carton shipments in 1981, compared to 35.6% in 1980, while SBS's share dropped to 36% from 37.3% the previous year.

However, the U.S. Bureau of Census and American Paper Institute (API) data for market shares in the folding carton industry indicate that SBS has not lost market share.

The discrepancy that is found in the figures is attributed by some industry marketing executives to the different sources used. PPC compiles its statistics from converters, while API and the U.S. Bureau of Census query the mills.

The U.S. Bureau of Census reported SBS accounted for an estimated 37.5% of the total 3.4 million tons of folding boxboard consumed in 1981, while the industry's consumption of clay-coated newsback accounted for just 36% of the market.

SBS and kraft board together comprised 50% of the folding-carton market in 1981, compared to 42% of the market in 1972.

Competition is close. Both sets of statistics, however, clearly point out that clay-coated news remains a close competitor for SBS. Furthermore, some feel that the competition is likely to become even more intense over the next few years.

Whether or not either grade will garner a majority of the market in the future is uncertain—and depends on a number of factors such as pricing and technological advances, as well as fuel, fiber, and other operating costs, observers say.

In recent years, the price differential between clay-coated newsback and solid bleached has widened considerably, giving recycled a significant competitive edge. Reduced overall costs enabled recycling mills to hold down their price increases.

TABLE 1: **Folding carton industry boxboard grade tonnage mix**

	1981	1980	1970	1960
Total kraft	48.0%	50.4%	40.9%	19.9%
Solid bleached sulfate	36.1	37.3	31.9	15.8
Solid unbleached sulfate	11.9	13.1	9.0	4.1
Total recycled	52.0	49.6	59.1	80.1
Clay-coated news	38.8	35.6	29.7	12.9
Other recycled	13.2	14.0	29.4	67.2
Chip	n.a.	4.7	9.7	12.6
Bleached manila	n.a.	2.1	5.1	15.8
Patent coated news	n.a.	2.0	9.2	29.8
Laminated	n.a.	3.5	3.9	7.0
Misc.	n.a.	1.7	1.5	2.0
Total kraft & recycled tonnage (000)	3274	3311	3075	2856

Source: Paperboard Packaging Council

Especially helpful has been the sharp drop in prices recycled mills pay for wastepaper, while higher energy costs have had a somewhat greater impact on virgin paperboard mills, even though a significant percentage of their total energy comes from burning spent pulping liquor, observers say.

Price gap widens. Early in the 1970s, SBS and clay-coated recycled prices were nearly the same on a per-1000-ft^2 (MSF) basis, observers say. Now, however, an 18-pt clay-coated board is more than $2/MSF less than a comparable 20-pt bleached board, according to one industry executive.

The price gap narrowed in September, though, when SBS producers dropped rollstock prices on 16-pt and higher calipers to $590/ton, essentially cancelling a July 1, 1981, price increase.

Recycled producers have reportedly kept posted prices at $425/ton for 20-pt clay-coated folding boxboard for some time. A considerable amount of discounting was reported, however, with one market observer saying that the ratio between SBS and recycled was still around $600/$400.

This indicated that at least in some markets recycled board pricing is roughly $25 below list figures.

Observers also report that solid unbleached sulfate (SUS) prices are nearly as low as clay-coated newsboard prices because of the intense price cutting occurring in the industry.

A drop of $25/short ton in September reduced 16-pt clay-coated kraft board to $475/ton, or $14.96/MSF compared to $14.15/MSF for a 16-pt clay-coated newsboard, said one executive.

SUS not a significant factor. Decline in the SUS price has reportedly not created a significant urge in demand. One boxboard consumer indicated that buyers are reluctant to commit themselves to using a SUS board because there are only two major suppliers.

One marketing executive expects SUS demand will continue to decline in the next few years because plastic two-liter bottles are replacing the need for six-packs of glass bottles in paperboard carriers.

PPC's report on folding paper box shipments in 1981 indicates that SUS demand dropped 9.7% and SBS was down 4.5%. Clay-coated recycled, by contrast, was up 7.8%.

Some market observers, however, feel that folding-carton market shares for recycled and virgin paperboard grades have been distorted by the recession, and will return to the same level as two years ago when the economy recovers.

During economic slowdowns, marketing executives say, consumers at the retail level change their buying patterns, which in turn causes a switch in the level of boxboard consumption.

For example, during recessions, consumers tend to buy less frozen food and more dry food, in addition to still purchasing a good amount of such staples as laundry detergent, toothpaste, and tissues, which are often packaged in recycled paperboard, while refrigerated foods tend to be sold in SBS board.

SBS gain in August. According to API figures for August, however, recycled paperboard production was down 7.4% for the first eight months of this year, compared to the same period last year, while solid bleached board was down only 6.6% for the same period.

The figures, however, include tonnage produced for the folding-carton industry, the largest market for both grades, as well as for other end uses.

But some observers say that the turn in the market began more than two decades ago and is not likely to be stopped now. In the 1960s, demand for clay-coated recycled increased at an annual rate of 9.5%, and in the 1970s demand was up 2.5% a year.

SBS demand, however, increased at slower annual rates of 8.1% in the 1960s and 2.3% in the 1970s. During this time, other grades of recycled paperboard declined significantly, opening up the market for clay-coated recycled board and SBS, as well as SUS.

Low recycled grades declining. Observers feel lower grades of recycled paperboard are likely to continue to decline while clay-coated newsboard and SBS will expand into that market. St. Regis Paper Co. president Edward J. McMahon feels the lion's share of that market will be captured by clay-coated newsboard. "We're confident we turned the corner in 1981 and are on our way up," he said.

A converting executive with a company that is also a major recycled board producer agrees. Plants operated by his company used to make about the same number of cartons from recycled as from bleached boards.

In the last two years, however, recycled is being used for 57% of the containers vs 43% made out of SBS. And, he expects by the end of the first quarter of 1983, that ratio will be more like 60%/40% in favor of recycled.

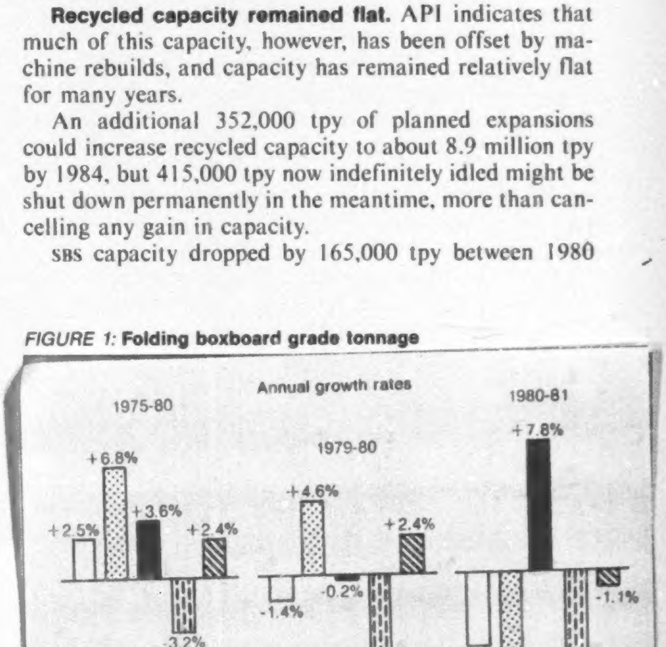
If clay-coated demand is actually heading upward in the next few years, though, its growth is likely to be prematurely stunted by insufficient capacity. Since 1970, a total of 75 recycled paperboard machines producing 2.2 million tons of all grades of recycled paperboard and accounting for 20% of capacity were shut down, says McMahon.

Recycled capacity remained flat. API indicates that much of this capacity, however, has been offset by machine rebuilds, and capacity has remained relatively flat for many years.

An additional 352,000 tpy of planned expansions could increase recycled capacity to about 8.9 million tpy by 1984, but 415,000 tpy now indefinitely idled might be shut down permanently in the meantime, more than cancelling any gain in capacity.

SBS capacity dropped by 165,000 tpy between 1980

FIGURE 1: **Folding boxboard grade tonnage**



Source: Paperboard Packaging Council

and 1981 because of producers allocating more machine time to making market pulp, and no new additions were planned as of late last year.

Earlier this year, however, International Paper Co. announced plans to increase SBS capacity at its Texarkana, Texas, mill by 100,000 tpy, and is studying possibly expanding its Pine Bluff, Ark., mill, which observers indicate would increase bleached board capacity by 50,000 tpy. Both projects would be completed by 1985.

A number of large users have switched from using solid bleached to clay-coated recycled board this year, including Duncan Hines on its cookie mix, Nabisco on its hot cereal boxes, and General Mills on its granola bar package.

Probably the most significant changeover in packaging, however, occurred this year when Procter & Gamble decided to use clay-coated newsback instead of SBS for its Pamper disposable diaper box.

Pampers switches to recycled. One executive noted that the Pampers decision should not be construed as a trend to downgrading, however, but rather as a natural evolution of an individual company's product. Pampers, he explained, has lost market share in recent years to elastic-legged diapers like Luvs and Huggies. This has induced P&G to reduce packaging costs and market Pampers as a less-expensive alternative to fitted diapers, he noted.

Bristol Myers, another large consumer of paperboard containers indicated it uses SBS for between 60% and 70% of its cartons and the remainder is made from recycled paperboard. Most of its products can be packaged in either, though, depending on what's available, noted a Bristol Myers purchasing executive.

Bristol Myers is considering increasing its consumption of SBS. Bufferin and Excedrin have both been switched to solid bleached paperboard packaging from clay-coated newsboard, and Ban roll-on and Mum deodorant packages also might be changed to SBS from recycled, said the company's paperboard buyer.

Bristol Myers, however, is looking at ways to reduce its packaging expenses, including possibly downgrading to recycled on some of its other packages or going to a lower density SBS board to make the cost comparable to a recycled board, said the buyer.

SBS still stronger, stiffer. Other companies have used the minimal packaging required to do the job for a number of years. Pillsbury's paperboard buyer indicated the company's buying patterns hadn't changed for years, and that they aren't likely to unless recycled producers are able to make a paperboard with comparable qualities to SBS—which is of a stronger and stiffer quality than newsboard.

In Pillsbury's case, for example, frozen foods cannot be packaged in recycled because it doesn't stack and hold up as well in high-humidity conditions and tends to darken when waxed.

Other manufacturers note that recycled will not be used to box such items as expensive toiletries because it doesn't connote the same quality as solid bleached. Also, packaging is considered to be a point-of-sale billboard and recycled does not print as well as SBS, some observers say.

Clay-coated news quality has, however, improved significantly in recent years, and some market observers say it even prints as well now as SBS, even in gravure and rotogravure printing. Technical improvements have also made newsboard more water-resistant and stiffer.

In addition, newer machines are able to make newsboard in calipers as low as 10-pt, as in the case of Federal Paper Board Co.'s Sprague, Conn., mill which has a Beloit Inver-Former machine that was installed in the mid-1960s.

A machine rebuilt with a Beloit Bel Bond former in the late 1970s at St. Regis's Battle Creek, Mich., mill produces calipers ranging from .012 to .026, and is expected to go down to .010 caliper eventually, according to McMahon.

Many recycled machines obsolete. Most recycled paperboard machines, however, produce boards of 16-pt caliper and higher. The majority are old cylinder machines that run at an average of about 400 fpm, according to one estimate.

A number of these older paper machines will probably have to be retired in the next several years, and this will probably have a significant impact on the market, which will have some impact on the competitiveness of recycled board.

One of the reasons that recycled producers have been able to offer their board at lower prices than SBS has been lower capital costs from operating older, depreciated facilities. If recycled board mills begin investing in newer machines, their capital costs will increase proportionately and will dull their competitive edge, according to observers.

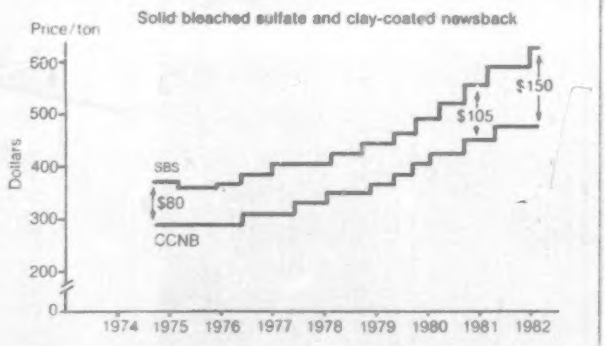
To keep their market share growing, recycled paperboard producers will have to keep their operating costs down.

One of the most significant factors in reduced expenses has been fiber prices, which in the past two years have been at historically low levels. Once the economy improves, however, wastepaper costs are expected to increase substantially. In addition, recycled board manufacturers will probably have to increase their prices as well.

Operating costs for solid bleached producers, however, are expected to decline. They have been investing in newer machines for some time and will start to get a better return on this investment as the economy picks up and these machines perform better.

In addition, SBS producers have more opportunity to reduce purchased energy costs through improving efficiency of their recovery processes and burning more woodwaste. ☐

FIGURE 2: **Folding boxboard price trends**



Source: Official Board Markets

Recession hits TiO_2 demand as imports increase

By BARRY SHOCKETT

U.S. statistics for titanium dioxide (000 short tons)

	1979r	1980r	1981	1982e
Capacity	1000	1000	1005	972
Production	742	727	750.5	680
Imports	105	98	125	130
Exports	49	42	61	60
Apparent consumption	798	783	814.5	750

Source: Bureau of Census, U.S. Dept. of Commerce

Canadian statistics for titanium dioxide (000 short tons)

	1979r	1980r	1981r	1982e
Capacity (nameplate)	79.4	79.4	82.7	82.7
Production	77	78.8	80.5	76
Imports	12.5	6.9	8	6.5
Exports	17.1	14.3	15.8	17.5
Apparent consumption	72.6	71.4	72.7	65

In 1982, production of titanium dioxide (TiO_2) will drop to about 680,000 tons, down 9.3% from 1981. Reduced demand resulted in the closure of NL Chemicals' New Jersey plant on Sept. 10, which reduced industry capacity to 905,000 tons. However, NL will continue to market and produce slurry at its Sayreville, N.J., plant, using TiO_2 from its plants in Canada and Europe. This should result in increased imports next year. Currently, about 75% of imports come from Canada, Fed Rep. Germany, France, and Spain. European shipments account for almost 60% of the total, the largest share (31.5%) held by imports from Germany.

The continuing slump in the construction and automative markets reduced Canadian demand by the paint industry by about 15%. As a result, due to excessive inventories, Tioxide Canada closed (for at least two months) one of its calciners at the beginning of September.

TITANIUM DIOXIDE

UNITED STATES

Uses: Both rutile and anatase grades of TiO_2 are used as fillers and coating pigments by the paper industry in printing/writing papers and paperboard. The largest end use is in paints (50%), followed by plastics (12%), rubber, ceramics, and other miscellaneous applications.

Demand: In 1981, the paper industry consumed an estimated 183,000 tons up 4% from 1980. This represented between 22% and 23% of total TiO_2 demand. Mill usage was expected to increase 5% this year. However, the drop in paperboard output and the relatively poor performance of coated papers resulted in overall industry usage dropping to approximately 170,000 tons in 1982.

Sources: The remaining five U.S. producers, in descending order of capacity, are: E.I. duPont, SCM Glidden, American Cyanamid, Gulf + Western, and Kerr-McGee. NL Chemicals closed its plant early in September.

Availability: There is no shortage of TiO_2 and industry operating rates have been 81% to 82% for the past three years. 1982, market; 1981, market; 1979, market; 1979, anatase, market; rutile, tight.

Pricing: Prices have remained unchanged since August 1981, when the price of anatase and rutile grades rose 6c to 7c/lb, respectively, to 70c and 75c/lb. There has been substantial discounting that was sparked by competition from low-priced European imports. Pricing history: 1982, anatase, 70c/lb, delivered; rutile, 75c/lb; 1981, anatase, 58c-70c/lb; rutile, 63c-75%/lb; 1980, anatase/rutile, 57c/lb; 1979, anatase, 53c/lb; rutile, 59c/lb; 1978, anatase, 46c/lb; rutile, 52c/lb.

Forecast: Imports are expected to increase in 1982 by about 4%, while total demand should drop about 8%. Unless the economy improves significantly in 1983, titanium dioxide consumption will remain depressed.

CANADA

Uses: About 90% of the anatase titanium dioxide used by the paper industry is employed in fine paper mills, with paperboard applications accounting for the rest. The paint industry is the largest dioxide consumer, followed by plastics and other applications.

Demand: Paper industry usage in 1981 of 7200 tons (10% of total consumption) was down about 12% from 1980. Industry usage in 1982 is expected to increase by about 500 tons to 7700 tons. In 1981, the paint industry accounted for 59% of the total, while plastics' share was 16%. Imports increased last year about 16%.

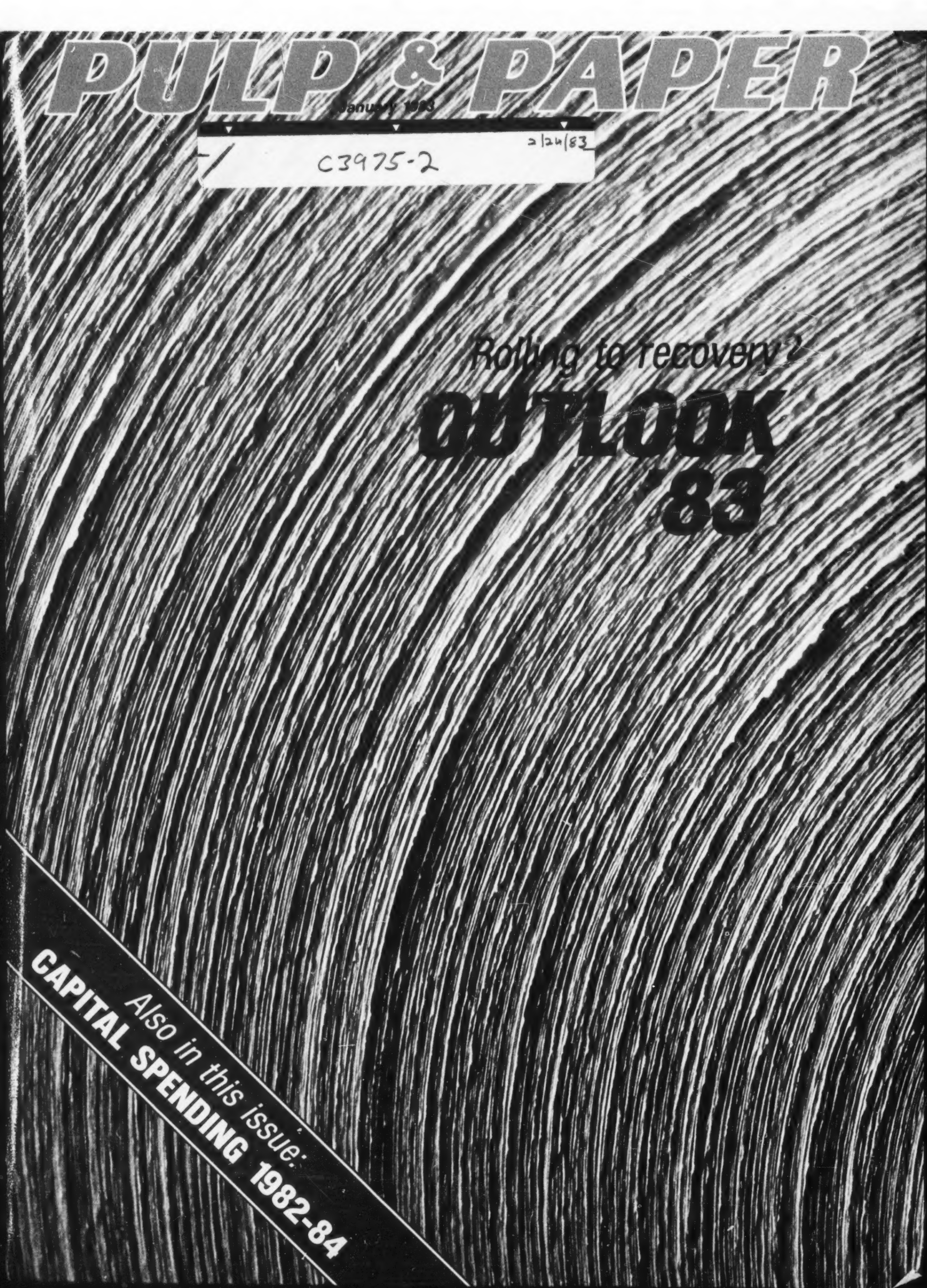
Sources: The two domestic producers are NL Chem Canada (formerly Canadian Titanium Pigments) and Tioxide Canada. About 52% of the imports (11% of total demand) are from the U.S., the balance coming from Europe.

Availability: Despite an industry operating rate of between 95% and 100%, increased domestic demand could be satisfied by reducing exports, until new capacity comes on-stream. 1982, anatase, market; 1981, market; 1979, market; 1979, market.

Pricing: Prices for untreated anatase TiO_2 have remained steady since Jan. 18, 1982, when they rose to 80c/lb (up 5.5c/lb), bags, delivered. Pricing history: 1982, 74.5c-80c/lb; 1981, 69c-74.5c/lb; 1980, [illegible]-69c/lb; 1979, 48.5c-59c/lb; Slurry shipments are 0.5c/lb extra.

Forecast: TiO_2 demand by the paper industry is predicted to increase 11% to 12%/year to mid-decade on the average. The average annual increase for total dioxide consumption is forecast to be 7.5%/year.

Mr. Shockett is consulting editor-chemical markets for PULP & PAPER.



PULP & PAPER

January 1983

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Rolling to recovery?

OUTLOOK '83

Also in this issue:

CAPITAL SPENDING 1982-84

PULP&PAPER

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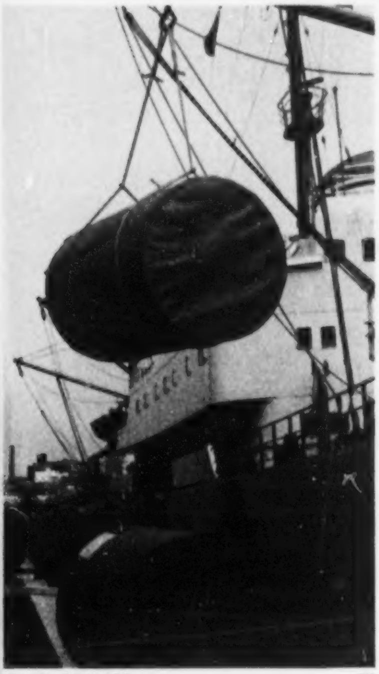

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COVER: *Side view of a roll of pulp (photo courtesy M.R. Castagane).*

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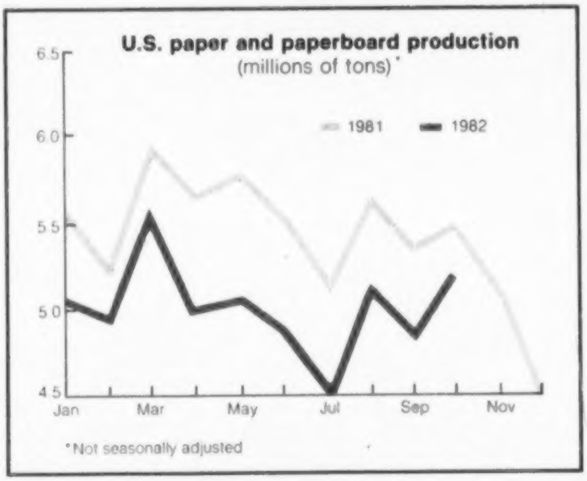
MONTH IN STATISTICS

U.S. paper and paperboard production in October totaled 5.2 million short tons, 2.3% below the October 1981 total, according to the American Paper Institute. The production trend, as measured by the two-month moving average of the seasonally adjusted data, was 60.9 million tpy, about 0.3% above the September trend level and 5.8% above the low reached in the May-June period. However, total output for the first ten months of the year was 5.2% below year ago.

Among major grades, newsprint production rose in October, bringing the ten-month rate to 5.1 million tpy. But printing/writing paper grades showed the strongest production trends, with coated paper 1.3% ahead of its year-ago level. Paperboard grades show similar trends. The ten-month data put total output down 7.4%, with containerboard output for domestic use down 8.6% and boxboard output for domestic use down 7.2%.

Total Canadian newsprint shipments in October came to 685,000 metric tons, down 13.8% from October 1981, according to the Canadian Pulp & Paper Assn. Newsprint mill operating rates rose to 76% from 60% in September, but were well below the 96% rate of a year earlier.


U.S. paper and paperboard production
(millions of tons)*

*Not seasonally adjusted

		Latest month (000 short tons)	% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION[1]					
Newsprint	October	448	−3.2	5,120	−2.8
Uncoated groundwood (s)	October	138	2.2	1,448	−1.8
Coated paper (s)	October	451	2.7	5,045	1.3
Uncoated free sheet (s)	October	674	−1.7	7,865	−2.1
Unbleached kraft packaging and industrial (s)	October	315	1.9	3,667	−6.7
Tissue	October	380	−3.1	4,409	‡−3.0
Total paper	**October**	**2,654**	**−1.3**	**30,503**	**−2.8**
Kraft linerboard, unbleached	October	1,191	−1.9	13,762	−7.9
Semichemical medium	October	378	−5.0	4,419	−8.6
Bleached paperboard	October	305	−5.3	3,736	−6.5
Recycled paperboard	October	579	−2.7	6,706	−6.8
Total paperboard	**October**	**2,539**	**−3.2**	**29,689**	**−7.4**
Total paper and paperboard*	**October**	**5,193**	**−2.3**	**60,203**	**−5.2**
PULP, WASTEPAPER & FIBER[2]					
Total woodpulp production	September	3,841	−10.8	49,865	−5.7
Market pulp production	September	431	−9.8	5,787	−7.5
Wastepaper consumption at paper/board mills	September	1,122	−7.2	13,722	−3.7
Pulpwood consumption (cords)	October	6,601	−0.7	79,345	−1.8
CONVERTED PRODUCTS STATISTICS[3]					
Corrugated box shipments (billion ft²)	October	21.064	−4.5	198.335†	−5.6
Containerboard inventories at box plants	Oct. 1	2,394	−2.1		
INTERNATIONAL TRADE[2]					
U.S. paper imports (including products)	September	657	6.3	7,941	−3.6
Imports of Canadian newsprint	September	484	−5.7	6,450†	−5.4
U.S. paper exports (including products)	September	379	5.3	4,294	−11.1
Exports of unbleached kraft linerboard	October	149	14.6	1,909	−1.4
Exports of woodpulp	September	298	−14.1	3,501	−6.9
CANADIAN STATISTICS[4] (reported in metric tons)					
Total newsprint shipments	October	685	−13.8	6,637†	−9.6
Operating rates	October	79%	97%	83%	94%
Inventories held by U.S. consumers	Oct. 31	1,358	−8.3		
Woodpulp shipments (export only)	October	397	−30.8	4,810†	−13.2
Operating rates	October	76%	96%	77%	87%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fiber Box Assn., Paperboard Packaging Council. 4. Canadian Pulp & Paper Assn.
*Includes construction and wet machine grades. †Not annualized. ‡Not directly comparable to year ago because of coding change. (s) = shipments.

TARIFFS

EC lifts duty on Swedish exports

In reaction to Sweden's 16% currency devaluation in October, the EEC Commission in November raised the duty on Sweden's exports of major printing/writing grades from an average of 4% to 10.9%, effective Nov. 13. Newsprint was not affected. EEC Commission officials claim Swedish printing/writing export ceilings to the European Economic Community have been reached.

The Commission reached its decision after EEC paper producers, who feared unfair competition from Swedish suppliers, lobbied for action. The increase was to be reviewed at year-end. Under existing agreements, tariffs are due to fall to 2% in 1983 and be phased out by the end of the year.

Sources say that since the tariff rise was only for seven weeks, its effect would be minimal. However, the new duty, together with a new 20% company dividend tax in 1983, is expected to hurt profitability in Sweden.

Tariff conflict on liner settled

Problems that U.S. kraft linerboard producers have encountered with Belgian customs officials have been eliminated by a new European Economic Community regulation. The new law, which took effect Nov. 4, allows high-yield kraft linerboard that contains more lignin than liner made in other chemical pulping processes to still be classified as a kraft product under EC tariff subheading 48.01 C II, "other kraft paper and kraft board."

Belgian officials were charging higher tariffs for liner made by the high-yield pulping process, claiming too much lignin remained in the fibers for the product to be considered true kraft linerboard, said a U.S. official.

The EC reached its decision after taking a poll of all its member states, and the consensus was that the quantity of lignin remaining in high-yield kraft linerboard was "not of great importance" allowing for classification as "other kraft paper and board" rather than "other paper and paperboard," according to the EC's mandate. Belgium subsequently agreed to accept the decision, said the official.

Another dispute involving EC's definition of kraft paper and board is still not resolved, however. U.S. officials are awaiting authorization from Congress to resume talks on the problem, which involves EC's requiring all kraft paper/board to contain at least 80% softwood. This excludes products such as bleached board and saturating kraft, as well as some linerboard, and groups them in a higher tariff classification.

MACHINERY

No growth seen for machine imports

Imports of pulp- and papermaking and converting machinery into the U.S. have remained relatively steady as a percentage of total purchases of such equipment over the past five years, according to a recent report by the U.S. International Trade Commission.

U.S. paper machinery shipments, exports, imports
(millions of $)

	1981	1980	1979	1978	1977
Producer shipments	$1325e	$1177	$1017	$799	$698
Exports	341	311	226	187	181
Imports	254	232	237	180	150
Apparent consumption	1237	1098	1028	792	668
Ratio imports/ consumption	20.5%	21.2%	23.0%	22.7%	22.5%

U.S. machinery imports/exports by most important countries of origin and destination
(000 tons)

Imports	1981	1980	1977
Finland	$76,598	$43,626	$23,443
W. Germany	56,581	66,486	49,268
Canada	25,305	34,150	12,646
Switzerland	21,769	19,067	20,135
Sweden	17,497	20,240	15,671
Japan	16,567	10,682	6,096
Italy	13,063	5,518	2,119
Exports			
Canada	80,658	62,928	44,650
Mexico	39,042	44,407	23,421
W. Germany	18,726	31,604	8,318
United Kingdom	18,212	13,527	6,622
Venezuela	14,261	12,350	9,450

e = estimated.
Source: U.S. International Trade Commission.

Paper machinery imports have risen from $150 million in 1977 to $254 million in 1981, but total U.S. purchases of such equipment have risen by a comparable amount so that the ratio of imports to total purchases has fluctuated between 20.5% and 23.0% during the five-year period, according to the ITC's *Summary of Trade & Tariff Information*.

Largest exporters of paper machinery to the U.S. in 1981 were Finland, Fed. Rep. of Germany, Canada, and Switzerland (see table). Finland was by far the largest exporter of primary pulp- and papermaking equipment to the U.S., with 1981 sales of $66.0 million, nearly triple the 1977 level of $23 million. Fed. Rep. of Germany was the largest exporter of pulp- and paper-finishing equipment with 1981 sales of $44.0 million. Switzerland led in paperboard converting equipment with shipments to the U.S. of $17.0 million in 1981.

U.S. exports of paper machinery nearly doubled from their 1977 level of $181 million to $341 million in 1981. Major export markets for U.S. machinery in 1981 were Canada at $80.7 million, Mexico at $39.0 million, and several of the larger European countries.

The ITC report shows U.S. tariffs on pulp and paper machinery and parts have declined from 3.5% in 1979 prior to multilateral tariff reductions to 2.2% this year and are scheduled to become duty-free in 1987. Selected tariffs for Canada, Mexico, and the EC show that in general U.S. equipment faces higher tariffs in these countries. For example, the EC tariff on paper machinery will drop from 4.6% in 1982 but remain at 3.8% even after tariff reductions take full effect.

Newsprint:

Operating rates fall as recession reduced consumption

Statistics:	**1981**	**1982**	**1983e**
UNITED STATES			
Production, 000 short tons	5065	5120	5139
Capacity, 000 tons	5334	5583	5710
Utilization rate, %	95	92	90
Apparent U.S. consumption			
000 tons	11,175	11,100	11,488
lb/capita	97.2	95.8	92.3
000 tons/$ billion real GNP	7.41	7.51	7.59
CANADA			
Production, 000 short tons	9650	9075	9235
Capacity, 000 tons	10,411	11,045	11,246
Utilization rate, %	93	82	82

e = estimate

Grade structure: Newspapers consume most of the newsprint made. Smaller factors in the market include advertising supplements, government publications, comic books, and commercial printing. Most newsprint is printed on letterpress machines, although offset printing has captured more than one-quarter of all U.S. consumption in recent years. The standard basis weight for newsprint remains 30 lb/3000 ft², up from the previous standard of 32 lb. common before 1974. Some newsprint 28.5 lb and lower is also made.

Production/capacity: A prolonged recession in the U.S. caused newsprint demand, particularly for Canadian paper, to fall off considerably in 1982, with mills there operating at 82% of capacity while U.S. mills ran at 92%. Canadian mills took a substantial amount of downtime and production dropped 6% to 9.075 million short tons compared to 9.650 million tons in 1981 while U.S. production remained relatively flat, increasing just 1% to 5.120 million tons from 5.065 million tons a year earlier.

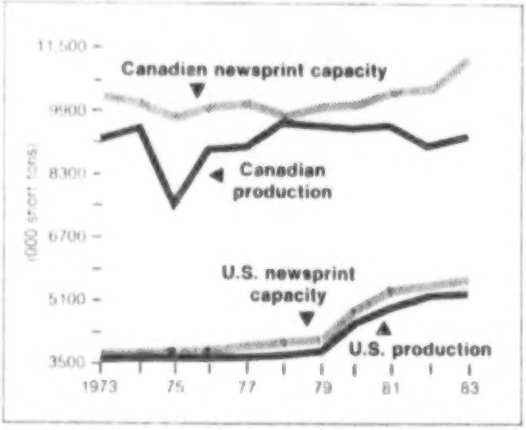
Canadian newsprint capacity jumped about 955,000 tons in 1982 from 1981, with new machines at British Columbia Forest Products Ltd. at Crofton, B.C.; Crown Zellerbach Canada Ltd. at Campbell River, B.C; Donohue Normick at Amos, Que.; and two machines at Ontario Paper Co. at Thorold, Ont.

The newsprint glut from overcapacity and falling demand resulted in a buildup of publisher inventories to 62 days of supply by the end of June. Stocks were cut to 48 days by end September, bringing levels toward the 40-day mark of a year ago.

Outlook: U.S. consumption in 1982 was off 0.7% to 11.1 million short tons from 11.175 million tons in 1981, but is expected to rise 2% to 4% in 1983. During the first quarter, publishers are expected to continue reducing stocks. And, with no strikes anticipated in British Columbia next year, inventories should remain low and increase only slightly as the economy improves.

U.S. capacity will be up 2.3% in 1983, with the biggest addition being 226,000-tpy Augusta Newsprint Co.'s mill in Augusta, Ga. Canadian capacity is expected to increase 4.5%, but that would change if several newsprint machines amounting to about 300,000 tons, now idled indefinitely, are shut down permanently. Operating rates for the U.S. and Canada should remain low next year, with Canada taking most of the downtime.

Pricing: Prices dropped $28/short ton to $425 on Nov. 1, 1981, effectively rolling back the mid-1981 price increase.



Estimated annual capacities of top companies are:

Annual capacity (000 short tons)

	Canada	**U.S.**	**Total**	**Capacity share (%)**
1. Abitibi-Price Inc.	1952	238[1]	2190	13.1
2. Bowater Inc.	577	878[2]	1455	8.7
3. CIP Inc.[3]	1133	—	1133	6.8
4. Consolidated-Bathurst	1050[4]	—	1050	6.3
5. MacMillan Bloedel	990	—	990	5.9
6. St. Regis Paper Co.	—	850[5]	850	5.1
7. Boise Cascade	249	461[6]	710	4.3
8. Ontario Paper	710	—	710	4.3
9. Kimberly-Clark	350[7]	339	689	4.1
10. Publishers Paper	—	575	575	3.4
11. Crown Zellerbach	430[8]	140	570	3.4
12. Kruger Inc.	526	—	526	3.2
13. B.C. Forest Products	480	—	480	2.9

[1] Includes 77,000 tpy from Boise Southern, DeRidder, La.; balance assigned to Boise Cascade.
[2] Includes 226,000 tons from Catawba Newsprint (51% owned); also 653,000 tons from Calhoun, Tenn.
[3] Subsidiary of Canadian Pacific Enterprises Ltd.
[4] Excludes No. 3 paper machine at Wayagamack div. mill, shut down indefinitely in 1982.
[5] Southland div.
[6] Includes 278,000 tons at Boise Southern Co.; balance of tonnage assigned to Abitibi-Price.
[7] Includes production at Spruce Falls Power & Paper Co. (50.5% owned).
[8] Canadian capacity being sold to Tasman Pulp & Paper of New Zealand, pending regulatory approvals.

North American capacity (1982): **16.683 million tons**
Capacity share of top five companies: 40.5%
Capacity share of top ten companies: 62.0%

Price history is as follows: (U.S. East contract): 1970, $152; 1971, $158; 1972, $165; 1973, $170; 1974, $235 (30-lb); 1975, $260; 1976, $285; 1977, $305; 1978, $345; 1979, $375; 1980, $426; 1981, $453; 1982, $425.

Markets: U.S. newspapers bought 56% of their newsprint from Canada in 1982, down from 59.6% in 1981 and 60.6% in 1980. Expanding U.S. capacity should continue this trend, with Canadian newsprint producers expected to supply only 55% to 56% of U.S. newsprint in 1983, down from 66% just five years earlier.

OUTLOOK '83

U.S. pulp/paper industry expected to begin road to recovery in '83

Moderate recovery seen lifting industry from deep slump caused by two recessions, excess capacity—but will strong price/profit rebound wait until '84?

SPECIAL PULP & PAPER REPORT

■ The U.S. paper industry should be on road to recovery in 1983, although some industry executives and analysts believe it may not be until late in the year or 1984 until prices and profits begin to rebound strongly.

While two back-to-back recessions have caused industry production to stagnate since 1979, capacity has continued to grow over that period at a roughly 2.5%/year rate. Estimated U.S. paper and paperboard production (excluding construction grades) of 59.7 million short tons in 1982 was down about 4.1% from 1981 and 2.6% from its level in 1979. But companies found it difficult to quickly turn off the capital spending spigot in the face of worsening market conditions once major expansion projects were already underway.

EXCESS CAPACITY. The result has been a sharp decline in U.S. paper industry operating rates from nearly 95% at the peak of the last industry cycle in 1979 to around 85% or 86% in 1982. Overcapacity combined with pressure on key export grades in overseas markets caused widespread price discounting which severely squeezed profit margins. With red ink from many wood products operations, the paper industry in 1982 experienced something like a 40% to 50% profit drop—worse than the 1974-75 recession in which paper production dropped more sharply.

"Overall, business conditions in 1982 were terrible, but near the end of the year, demand for some of the industry's products was beginning to show improvement," according to Dr. Edwin A. Gee, chairman and CEO of International Paper Co. A similar view was expressed by Steven C. Mason, president and chief operating officer of Mead Corp., who called 1982 a "disastrous year for the forest products industry," describing its greatest disappointment as the "continuing and increasing weakness in prices." His current assessment is that "we are now bumping along at the bottom" with some very mixed signals from different commodities and products."

MODERATE RECOVERY. Both IP and Mead look for about a 3% increase in real GNP in 1983—a very moderate rise for the first year of an economic recovery—after a 1.5% decline during the past year. "A large part of this increase will be accounted for by higher consumer spending and a corresponding rebound in industrial production," said Gee. "We expect interest rates to be lower in 1983, with the prime rate projected to drop further, and inflation to stay in the moderate range of about 6%."

Norma Pace, senior vice president of the American Paper Institute, looks for a 3.5% advance in real GNP, a 6.5% rise in industrial production and a decline in the prime rate to about 10% in the first half, with a slight uptick in interest rates in the second half. "The best way to get the recovery moving is to lower interest rates and I think the Federal Reserve has shifted its policy, after holding monetary reins too tight in 1982."

Her biggest fear is that "demagoguery over the budget deficit is going to delay the recovery by putting an expectation factor on interest rates that really shouldn't be there." Added Richard B. Madden, chairman and CEO, Potlatch Corp.: "The recovery could end just as quickly as it begins if interest rates go back up again, which is exactly what happened in 1980," With the fiscal 1983 federal budget deficit projected by some economists to run from $170 to $180 million, he feels that not enough is being done to curtail government spending. "The thorny issues relative to social security and defense (spending) must be addressed."

IMPROVING PRODUCTION. Most industry executives and analysts expect paper and paperboard production to show only a moderate recovery next year in line with the economy. IP's Gee looks for 3% to 4% growth in volume with operating rates improving by around 2%, "so while there will be growth, there is no way that it could be described as vigorous." Mason of Mead expects the recovery to be gradual, without much momentum before the second half. "1983 won't be a great year for forest products, but it should represent a substantial improvement over 1982."

Outlook '83 was prepared by P&P's news staff consisting of Will Mies, Dave Allan, Paula Irons, and Debra Adams.

Rolling to recovery?

Data Resources Inc., a leading economic forecasting firm, expects U.S. paper and paperboard production to increase 5.2% in 1983 to 62.9 million tons but this is expected to result in an average operating rate of only 89% in 1983 due to further increases in capacity. Security analysts with leading Wall Street investment firms on average look for 4.8% increase in production and operating rates of about 89% for paper and 88% for paperboard this year.

Not much lift is expected from export markets either, which most industry observers expect will come back even slower than the domestic economy. "The combination of a strong U.S. dollar and the Swedish devaluation in 1982 had a strong impact on pricing and demand for export commodities and this will carry over into 1983," Mason commented. "With overseas economic growth expected to be about 2%, and with the dollar likely to continue to be relatively high, 1983 will be a year of slow growth in export markets," said Gee.

PRICING UNCERTAIN. What worries some analysts is that the modest economic recovery projected for next year may not pull industry operating rates far enough out of their deep slump to enable companies to raise prices very much next year. "Operating rates in 1982 will range between 83% to 86% and, if our economic forecasts are about right for 1983, will be little changed this year," commented Lawrence A. Ross, an analyst with Paine Webber Mitchell Hutchins Inc., who expects 1983 price levels to remain unchanged to up 2% "at best."

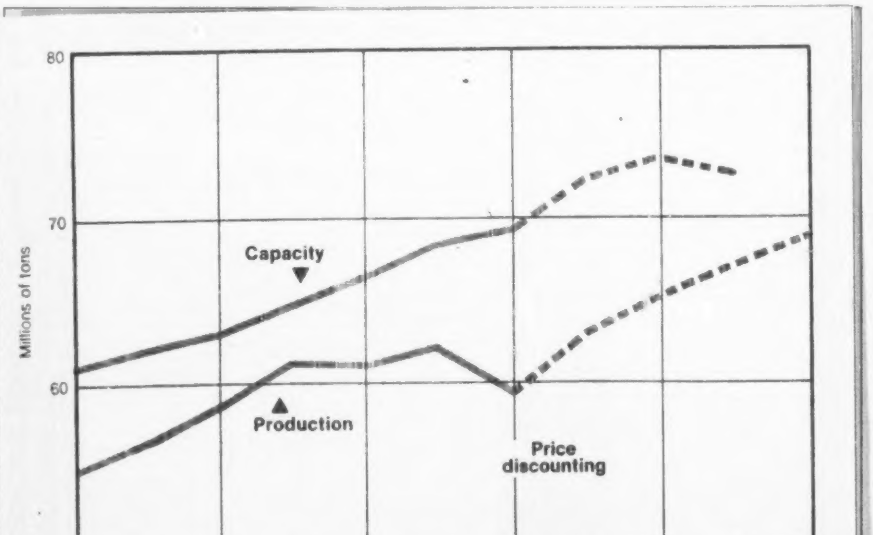
Most analysts are more optimistic and on average look for a 4.1% increase in industry price levels this year after about a 2% to 3% decline last year year. One factor that causes some analysts to be more upbeat about industry operating levels in 1983 is the large number of capacity shutdowns being caused the the recession. Bruce Kirk, of Goldman Sachs, estimated financial pressures will have caused 1.9 million tons of industry capacity to have shut down by the end of 1982, with another, more normal 800,000 tons closing in 1983.

MODERATION IN COSTS. Costs are rising at a slower rate than before the recession and this is also causing some optimism about 1983. "Oil costs are lower, wage increases are no longer double digit, raw material and chemical costs have been at least stable and, in many instances lower," John R. Kennedy Jr., president and CEO of Federal Paper Board Co. Inc., said recently.

And Mark S. Rogers, an analyst with Dean Witter Reynolds, noted: "The industry's three most important variable costs—fiber, labor, and energy—are on average increasing at rates more than 50% below those which were common through the 1970s." On average, analysts look for about a 3% increase in costs per unit of output in 1983—about the same level of increase as in 1982.

U.S. PAPER AND PAPERBOARD TRENDS, 1976-86

Production and capacity



Source: American Paper Institute statistics; Data Resources Inc. estimates

WHAT ANALYSTS ARE PROJECTING FOR 1983

	Percentage change from 1982 levels							
	Growth in real GNP	Paper/board production[1]	Operating rates[2]		Prices paper/board	Costs per unit output	Operating profits[3]	
			Paper	Paperboard			Paper	Forest Prod.
Rodney Young/J. Wilson Data Resources	+3.0%	+5.2%	90.0%	88.0%	+4.1%	+5.6%	n.a.	n.a.
Mark S. Rogers Dean Witter	+3.8	+5.1	89.4	87.8	+9.4	+6.1	+66%	+216%
Mary K. Fraser Donaldson, Lufkin	+3.7	+6.0	88.0	88.0	0.0	+2.5	−15	+500
Bruce Kirk Goldman Sachs	+3.0	+6.0	—90.9—		n.a.	+1.0	+30 to +60	n.m.[3]
Chad E. Brown Kidder Peabody	+2.4	+5.0	91.0	90.0	+5.0	+1.0	+50	n.m.[3]
Clarence W. Brown Lehman Brothers	+4.0	+5.0	90.0	89.0	+6.0	+5.0	+40	+100
Thomas P. Clephane Morgan Stanley	+3.0	+4.2	88.2	85.7	+3.0	+1.8	+37	+346
Gary Palmero Oppenheimer	+2.8	+5.5	89.5	90.0	+4.0	+4.5	+15	+300 to +500
Lawrence Ross Paine Webber	+1.9	+1 to +2	86.0	84.0	0 to +2	+1 to +2	Flat to down	n.m.[3]
George Adler Smith Barney	+2.4	n.a.	89.5	87.5	+4.0	+3.0	+15	n.m.[3]
Average	+3.0	+4.8	89.3	88.1	+4.1	+3.2	+28.1	+312.4[3]

1. Excludes construction and wet machine grades in most cases.
2. Production as percent of capacity.
3. After-tax profit excluding extraordinary or nonrecurring items. Earnings for paper companies generally include some contribution from wood products, while forest products profits derive partly from paper operations. Percentage profit increases for forest products firms not meaningful in many cases since a loss or close to breakeven profit was estimated for 1982.

Profit projections for the paper industry this year vary widely, with some analysts looking for flat to declining earnings, while others look for increases of 50% to 60%. One factor that will help most companies is that nearly all are partly integrated into the wood products business, which is expected to go from a loss position in 1982 to a level of moderate profitability this year. Earnings of forest products companies that derive the largest share of their sales from lumber, plywood, and other wood products should rise dramatically.

CAPITAL SPENDING WEAK. Capital spending, however, will probably not revive significantly this year because of the need for companies shore up their balance sheets. Donald P. Brennan, head of Morgan Stanley's new forest products investment unit, noted that many companies in the industry are "pretty close to the wall and pressing the limits of what would be considered prudent debt."

Kenneth E. Lowe, director of newly formed Communication & Information Services, said "there is no way the paper industy can maintain capital spending at the plus-$6-billion level without substantially increasing long-term debt and reducing dividends—and that would be unpalatable to most companies." Thus he projects U.S. paper industry capital spending will decline by nearly 5% in 1983 from a base of $5.9 billion in 1982.

This assessment tends to be supported by PULP & PAPER's annual capital spending survey, which shows outlays over the three-year period 1982-84 declining by nearly 8% from their 1981-83 level reported in last year's survey (see p. 79). Data Resources projects industry capacity will only grow about 1.4% in 1983, 1.0% in 1984, and 1.1% in 1985 before beginning to pick up in 1986-87.

LONGER-RUN OUTLOOK. But slowing capacity growth will lay the groundwork for the eventual resurgence of paper industry operating rates and profitability in mid-decade. DRI projects paper and paperboard production will rise by 5.2% from 59.8 million tons last year to 62.9 million tons in 1983 with a further increase of 4.1% in 1984, 2.4% in 1985, and 2.3% in 1986 to a peak of 68.6 million tons in the next cycle. Because of lower capacity growth, paperboard grades will have the highest operating rates at the 1986 peak—99% for solid bleached board and 97% for unbleached kraft linerboard, while domestic newsprint will also enjoy a 97% rate and uncoated free sheet is at 95%, according to DRI's Rodney L. Young.

Market pulp is also expected to be very tight at the peak of the next cycle, with combined operating rates for North American and Scandinavian producers hitting 95% and those for U.S. mills reaching 99%. The price of northern softwood bleached kraft is expected to soar to a level of $930/metric ton by 1987 from its current depressed level of around $420/ton.

OPTIMISM ABOUT HOUSING. The longer-run outlook for the wood products side of the industry is also reasonably bright, although few observers expect the boom years of the late 1970s to return. Young said that DRI projects "fairly good recovery" in housing starts, with the number of units rising to 1.39 million in 1983, 1.68 million in 1984, and 1.80 million in 1985.

International Paper expects housing starts to average 1.6 million units between 1983 and 1987, although Gee noted that "houses built during this period will most likely be smaller than houses built in recent years. "Consequently, less lumber and plywood will be consumed per new housing unit, so the growth rate in consumption should be about 2% annually after 1983."

UNCOATED FREE-SHEET

Long-delayed rebound

Twelve months after paper industry analysts predicted an upturn in uncoated free-sheet demand by mid-1982, industry observers still feel a rebound is imminent. But most now caution that any change from current shipment levels will roughly match changes in U.S. real GNP. A consensus sees demand for uncoated free-sheet in 1983 improving by 2.5% to 3.5% over 1982 levels—assuming the GNP grows by about the same amount.

Signs of a quickening in demand were showing up in various ways throughout the second half of 1982. Shipments of xerographic paper bottomed out in December 1981, and then from March 1982 on they exceeded year-earlier performances. Shipments of most other major grades of uncoated free-sheet were turning up by the fall from dismal first-half levels, although they still lag well behind 1980's record. Indeed, most observers predict total uncoated free-sheet shipments will rise about 3.5%, to 8.1 million tons, only 100,000 tons or so above 1980's performance.

Mead Paper's Austin Lance, manager-market research for the fine paper division, says this kind of growth rate will push operating rates up to between 89% and 91%, an improvement over the 87% rate that one executive estimated was typical for the industry in the fall of 1982.

Poor operating rates have not been the only problem facing the industry: pricing weakened across the board in uncoated free-sheet, and in commodity areas like offset printing papers it virtually collapsed. Price weakness really began in 1981 and snowballed during 1982, creating a momentum that may take fairly high operating rates to reverse—especially with market pulp prices likely to remain soft, acting as a brake on paper price increases.

While pricing may be slow to recover, most observers think demand for several grades of uncoated free-sheet will grow considerably faster than the economy as a whole. One executive predicted forms bond shipments will rise by 5% to 5.5% in 1983, with carbonless forms paper basestock shooting up at a 6% to 7% pace and the bond/mimeo/duplicating/xerographic group going up by 5.5% to 6%. A Champion International spokesman noted that some inventory rebuilding should aid shipments, although Mead's Lance noted that mill inventories are currently high.

Some executives doubt the big publishing sector of uncoated free-sheet will match the shipment growth of the business papers group, however. Lance predicts that "offset book papers will be less vigorous, achieving only a 4% increase in 1983 and averaging 4% annual growth rate over the next several years." But Union Camp Corp.'s Robert Sasser, general sales manager for bleached paper and board, expects offset paper demand to grow by 5% to 5.5% in 1983. He is less bullish on the remaining uncoated free-sheet grades, however, estimating envelope papers will see demand rise by 2% to 2.5%, tablet will be "flat to a decline of 2%," and other grades including cover and text, papeterie, and miscellaneous papers will be "flat to up slightly."

One problem uncoated free-sheet mills may increasingly have to cope with this year is competition from coated groundwood mills suffering from overcapacity in their industry. Some will respond by producing uncoated paper just to keep machines running. But Union Camp's Sasser noted there is little chance for coated groundwood to penetrate traditional uncoated markets such as cut-size paper or forms bond, adding that "the issue seems to be whether the natural coated groundwood markets (magazines, mass market catalogs) will grow in pace with capacity."

Beyond 1983, some observers see problems developing for the industry as several new machines come on-line through the mid-decade (see table). That will create potential headaches for many existing mills. About 21% of uncoated free-sheet capacity is located in nonintegrated mills, relying on purchased pulp, and many of those mills are small and hampered by high operating costs in addition to pulp-purchasing expenses.

Union Camp's Sasser thinks a restructuring of the industry could take place in the next few years, as new capacity forces "medium-efficiency" mills away from commodity grades and toward specialties, freezing out some of today's small, relatively inefficient mills.

Mead's Lance pointed out that "announced capacity increases over the next three years average 2.7%," and "that's not a great deal of tonnage to absorb if we continue to move out of the recession." A Champion spokesman predicted that "the new capacity will come on-stream as the markets firm. This incremental tonnage will be absorbed readily in the expanding market."

Some new capacity announcements may still be made in the next year or two, another executive noted; but he speculated capital spending seems more likely to focus on modernizing existing mills than adding new machines.

MAJOR NORTH AMERICAN PRINTING/WRITNG PAPER CAPACITY CHANGES

Project	Location	Capacity (000 tons)	Startup
Coated free-sheet (Nos. 1 to 3)			
Consolidated	Wisconsin Rapids, Wis.	n.a.	1983
Scott Paper	Skowhegan, Maine	200	1983
Scott Paper	Muskegon, Mich.	n.a.	1983
Consolidated[r]	Stevens Pt., Wis.	11	1984
Champion[1]	Quinnesec, Mich.	n.a.	n.a.
Westvaco[1]	Luke, Md. or Wickliffe, Ky.	150	n.a.
Coated groundwood (Nos. 4 and 5)			
Pentair/Niagara[r]	Niagara, Wis.	15	1983
Pentair/Niagara[r]	Niagara, Wis.	15	1984
Blandin Paper[1]	Grand Rapids, Mich.	177	n.a.
Nitec[1,2,r]	Niagara Falls, N.Y.	55	n.a.
Weyerhaeuser[1]	Columbus, Miss.	n.a.	n.a.
Uncoated free sheet			
Champion	Courtland, Ala.	145	1983
Great Lakes	Dryden, Ont.	59[3]	1983
Great Northern	Nekoosa, Wis.	n.a.	1983
Crown Zellerbach	Camas, Wash.	160	1984
International Paper[r]	Georgetown, S.C.	120	1984
Pentair/Flambeau[r]	Park Falls, Wis.	18	1984
Union Camp	Eastover, S.C.	210	1984
James River[r]	Gorham, N.H.	25	1986
Boise Cascade[1]	International Falls, Minn.	n.a.	n.a.
Champion[1]	Quinnesec, Mich.	n.a.	n.a.
Champion[1]	Halifax, N.C.	n.a.	n.a.
Domtar[1]	Windsor, Que.	n.a.	n.a.
Georgia-Pacific[1]	Port Hudson, La.	138	n.a.
MacMillan Bloedel[1]	New Westminster, B.C.	83	n.a.
Makin Project Ltd.[1]	Red Deer, Alta.	48	n.a.
Weyerhaeuser Co.[1]	Columbus, Miss.	200	n.a.

n.a.=not available. r=rebuild or modernization.

1. Under consideration or rumored
2. Nitec mill is shut down indefinitely, in course of Chap. XI reorganization; modernization plan announced before shutdown.
3. Net increase from installation of one new 135,000-tpy machine replacing three existing units.

COATED PAPER

Overcapacity hangover grows

Coated paper mills will sell more paper this year than last, increasing production levels at a faster pace than the growth rate in the U.S. economy. But with coated groundwood capacity available far in excess of even the most optimistic demand projections, operating rates for groundwood mills will actually fall slightly in 1983. Coated free-sheet mills won't improve their operating rates over an unimpressive 1982 performance either, suffering from competition with surplus coated groundwood plus a free-sheet capacity rise of 4.6% for the year, slightly above expected demand.

Overcapacity on the coated groundwood side is so severe that some observers expect significant shutdowns in the next few years, while others believe temporary shutdowns will continue through 1983 and even 1984.

A spokesman for Champion International Corp. predicted that "coated groundwood capacity will be absorbed in two to three years," and an executive with another company said it could take until as late as 1984. The Champion spokesman added that "export activity will determine this to some extent." Champion also points to catalogs and direct mail end-uses significantly outperforming book publishing end-uses and helping the industry to absorb the new capacity.

Mead Corp.'s Austin Lance, manager of market research for fine papers, believes that "coated groundwood will poach upon coated free-sheet in some areas, particularly in the No. 3 and 4 category." Lance expects the groundwood industry to respond with a combination of competitive pricing, extra downtime, and possibly machine shutdowns. All of that will make further market penetration by supercalendered uncoated groundwood difficult, he added.

Coated paper was already suffering from overcapacity as well as soft demand in 1982, and as Champion noted in releasing its third-quarter figures, "coated paper prices, while above those of a year ago, were below those of last quarter." On the other hand, Scott Paper's third-quarter report pointed out that "during the quarter, demand for coated printing paper, which had been soft earlier in the year, showed improvement."

A Champion spokesman predicted coated paper shipments in 1983 will be up 3.6% from 1982, reaching 5.2 million tons, while Mead's Lance thinks coated groundwood shipments could rise as much as 5% or 6%—in contrast with free-sheet, where he thinks shipments will grow by less than the 4.6% capacity increase scheduled for that grade in 1983.

If those levels are reached, operating rates should be at or slightly below present levels, and Lance puts free-sheet at 90% to 91%, while he estimates groundwood at 85% to 86%. Depressing the free-sheet and groundwood operating rates slightly, another marketing executive noted, could be the new 200,000-tpy Scott Paper free-sheet machine starting up in Skowhegan, Maine, in the first half of 1983. Granting that the Scott installation is a free-sheet machine, he noted that "we understand that the marketing plan is to try to insert tonnage into that market segment where the high-brightness groundwood grades, No. 4 grades, have been so successful."

Lance noted that "No. 1 coated through the first three quarters of 1982 has seen a 1.5% increase over last year. Nos. 2 and 3, on the other hand, have declined 5% to 6%. Recent moratorium and allocation announcements have been directed toward the higher coated grades. With coated free-sheet operating rates in the low 90s, the view from here is that any shortages this fall are temporary in nature. Once the economy really shows it's in a recovery pattern, commercial printing and other coated free-sheet end-uses will equal or slightly exceed the general economy."

TISSUE

Healthy growth ahead

Tissue mills enjoyed perhaps the best profit performance in the paper industry in 1982 despite sometimes hectic promotional discounting and an operating rate that Smith Barney, Harris Upham & Co. analyst George Adler estimated at just 86.6%. Most observers believe tissue mills will continue to outshine much of the industry in 1983.

This record, especially impressive in a serious recession, results as much from the nature of the product as from the management styles of the companies themselves. Tissue products in general are not considered to be discretionary items, and even where they are, they have other advantages that may prove decisive—as in the choice between paper diapers and cloth diapers, where families have tended to economize not by stocking up on the cloth alternative but by switching to a less expensive but still convenient private label paper diaper.

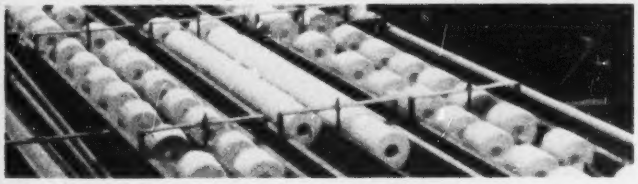
Some areas of the industry should do better than others, however. The industry as a whole, which Adler believes produced 3.5% less in 1982 than in 1981 on a tonnage basis, should see output rebound with a 3.2% growth rate this year. Shipment volume on a unit basis should be more rapid than that, "also aided by bathroom tissue such as in the case of Procter & Gamble's new price brand, Banner," according to Adler. Paper towels and facial tissue "are more sensitive to changes in the economy" and therefore "should see larger gains" than even bathroom tissue, he said, while shipments of disposable diapers should rise at 6% to 7% in 1983, up from 5% in 1982 and approaching the 7% growth rate of 1981.

The 1982 tonnage production figure makes the situation appear worse than it really was, Adler notes, since mill and warehouse inventories were worked down during the year, and thus tonnage shipments probably did not decline by as much as the production figures did. Also, "unit volume of the various tissue grades in the first half of 1982 increased by a small amount, particularly a reflection of a shift to single-ply products as well as lower sheet counts per roll and box," Adler added. James River Corp., reflecting the results of tissue operations newly acquired from American Can Co., said sanitary product demand during its quarter ended Oct. 24, 1982, "remained relatively steady."

Most of the tissue industry's products are tied for their growth to the increase in U.S. population, but in Canada—and more so in many other countries—tissue products have still not reached the market saturation level they have in the U.S., and are still growing faster than population. Facelle Co. Ltd. president Brian Blakely said he expects Canadian shipments to rise by 4% in 1983—four times the rate of increase of that country's population—from the 460,000-short ton level of 1982, which in turn was up 4% from 1981.

However, Blakely expected facial tissue to drop slightly in 1982 and remain flat in 1983, while bathroom tissue should grow at about 3% this year and paper towels by about 4.5%. He also believes napkin shipment growth rates will approximate population growth rates.

Slightly depressed operating rates have hurt pricing in several recent years, but Adler thinks the U.S. rate will rise to 88.2% in 1983 and to 91.9% in 1984, or within 1% of the historically strong 92.8% rate of 1979. "Favorable" operating rates should continue in the mid-1980s because capacity expansion will focus largely on incremental increases through machine improvements, Adler believes. Wisconsin Tissue's new 60,000-tpy tissue machine, which started up in December 1982, is the last new U.S. machine currently scheduled to start up, although Scott Paper Co.'s 54,000-tpy "high technology" Everett, Wash., machine—idled indefinitely in 1982 after only a few months in operation—could start up again, adding production to the exceptionally volatile West Coast market.



But with U.S. capacity largely flattening out, Adler expects tissue prices, which haven't gone up since Fall 1981, to rise in Spring 1983 while promotional discounting may ebb under the influence of higher operating rates.

Blakely sees Canada's operating rate rising as well, from 86% in 1982 to about 90% in 1983 despite startup in 1981 of a new 30,000-short-tpy Facelle machine and modernizations announced by Scott Canada for Crabtree and Lennoxville, Que. For 1984, Scott also announced a new 40,000-tpy tissue machine for New Westminster, B.C. As Blakely noted, "all announced additions are in wider, high-speed machines, which puts pressure on older, narrower and high-cost production machines still operating in Canada."

Wastepaper price softness had its negative side for the commercial and industrial (C&I) side of the industry in the U.S., giving some competitors a cost justification for slashing prices in 1982. Also, an increase in the number of competitors in that market because of vigorous growth in C&I tissue in recent years added capacity more rapidly in C&I than in consumer, at a time when established players such as Wisconsin Tissue were expanding. At the same time, C&I mills were suffering from economic facts of life such as a slowdown in office building construction, reduced vacation travel and increased hotel/motel vacancy rates and shutdowns of factories throughout North America—all of which depressed demand by as much as 10% in 1982, in the estimate of one mill executive.

CONTAINERBOARD

Flat capacity growth seen

The U.S. containerboard industry is mired in a serious depression, but most industry executives and analysts look for at least some moderate improvement in 1983 and even tighter market conditions in 1984 and beyond. This is partly due to improving demand—but also to the fact that dismal financial results have discouraged new capacity additions and are causing the closure of some marginal, high-cost facilities.

Most observers look for about a 4% to 5% improvement in corrugated container shipments in 1983, following about a 4% to 5% decline in 1982 that reflected the severe slump in U.S. industrial production. For example, Roger W. Stone, chairman and CEO of Stone Container Corp., looks for a 5% improvement in corrugated container shipments in 1983.

WEAK BOX SHIPMENTS. "Shipments to nondurables, food and fresh produce (customers) should continue to be healthy, but a really strong market will require the recovery of interest-sensitive sectors of the economy such as housing and automobiles," commented the containerboard marketing vice president of one major company. "Regional shifts should continue to favor the South and West."

Depressed domestic corrugated box demand, inventory reduction and a sharp drop in export shipments caused linerboard production in 1982 to drop about 7% to around 13.5 million tons. While linerboard production last year was not much higher than its level in 1978, capacity over this same period has been growing by more than 3%/year. This has caused linerboard operating rates to drop from a high of 98% in 1979 to around 86% in 1982. Semichemical medium has followed the same downtrend, although somewhat less dramatically.

Remaining high inventorylevels of containerboard at box plants and mills will probably mean a slower pickup for board production in 1983. Evadna S. Lynn, a Merrill Lynch analyst, estimates U.S. liner output will rise only 2.4% in 1983, resulting in an operating rate of 86%. Roger Stone, however, looks for a more than 5% rise, with export shipments exceeding domestic demand, resulting in a more than 90% operating rate. And the marketing vice-president of another major company estimates operating rates for both liner and medium will average 90% in 1983.

Containerboard inventories at box plants and mills dropped from 2.7 million tons at the beginning of 1982 to 2.4 million tons at Nov. 1, which is still high by historical standards. One industry executive expects inventories "to remain high through 1983, with year-end levels similar to 1982," and then decline relative to box plant consumption. Stone, however, said inventories could drop below 2 million tons by the final quarter of 1983.

PROFIT SQUEEZE. Slack market conditions have resulted in considerable pressure on prices since the fourth quarter of 1981. Rebating from the $300/ton list price for 42-lb liner swept through the industry last winter and then recurred again late last spring with effective prices by November deteriorating to $250/ton—and even lower after freight allowances and other discounts.

This brought prices essentially back to their level in 1979, with disastrous consequences on industry profit margins. "Profits last year were generally dismal throughout the industry, with many manufacturers showing losses," one company executive noted. "Profit margins will remain low in 1983 until prices improve." Analyst Lynn believes that even though margins on liner manufacturing will improve in 1983, integrated operations could show another decline due to increased box market competition.

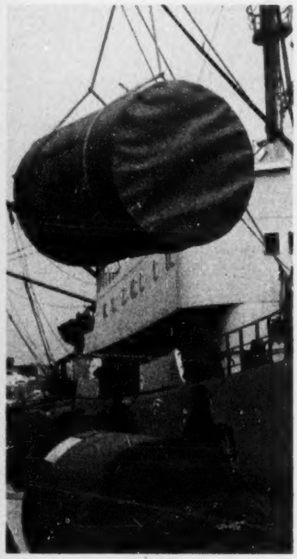
CAPACITY SHAKEOUT. The positive side of this gloomy picture is that most major containerboard capacity additions through 1984 have been postponed or cancelled, while some older, high-cost production facilities are being shut down. With the startup of MacMillan Bloedel's new 210,000-tpy medium machine at Pine Hill in December, not a single major producer has a new liner or medium machine scheduled to come on-line.

Meanwhile, International Paper Co. is phasing out

465,000-tpy of linerboard capacity at its Georgetown, S.C., mill as part of a program to convert the mill to more profitable bleached grades and recently shut down its older 215,000-tpy Bastrop, La., semichemical mill. Manville Forest Products has indefinitely idled a 106,000-tpy corrugating machine at its Manville, La., mill, and St. Regis Paper Co. is looking for a buyer for its money-losing 465,000-tpy Jacksonville, Fla., liner/kraft paper mill.

"As a result, there will probably be virtually no growth in capacity during 1982-84," according to Lynn. Incremental growth from several new machines as well as new technology (Beloit's new extended nip press which can increase machine capacity by 15% to 20%) will tend to be offset by some machine closures, she said. Excluded from this estimate, however, is any further shifting of kraft paper capacity to linerboard production because of plastic inroads into the packaging paper market—especially kraft grocery carryout sacks, which until recently have been relatively unscathed.

EXPORTS SLUMP. From a 1980 peak of 2.2 million short tons, export shipments of U.S. unbleached kraft liner dropped 20.5% in 1981 and declined about another 3% in 1982 due to the worldwide recession, the strengthening of the dollar in relation to most other currencies, and a dropoff of new orders from People's Rep. of China.



The continuing strength of the dollar and slow recovery of the European and Japanese economies would seem to indicate a fairly slow recovery for liner exports. "Exports for 1983 should be roughly at 1982 levels, strengthening at the end of the year as foreign economies recover," the marketing vice president commented. "The strongest demand growth should come from the Far East."

LONGER-RUN OUTLOOK. Thus, 1983 should put containerboard back on the road to recovery but real improvement in industry profitability may not come until 1984, when accelerating demand and flat industry capacity growth should cause operating rates to rise sharply.

Lynn projects 1984 operating rates for linerboard of 93.5%, while Rodney Young of Data Resources Inc. looks for a 94.5% rate. Gary Palmero, an analyst with Oppenheimer & Co. who estimates that as much as 400,000 to 800,000 tpy of industry capacity could be shut down by the end of 1984, looks for a 97% rate. This should enable producers to raise prices more rapidly, causing a substantial and much-needed rebound in profits.

BOXBOARD

Market shares shifting

Boxboard production dropped 8% in the first nine months of 1982 compared to the same period in 1981, with solid bleached sulfate paperboard off by 7% and recycled down 7.4%, according to American Paper Institute. Industry observers, however, said demand for clay-coated newsback, the largest recycled boxboard grade, held up better during 1982, causing SBS to lose some market share to newsback.

Some felt clay-coated should maintain its leadership position in the industry, while others said that any shifting to recycled from SBS over the last two years is due to a lagging economy and market shares should return to normal when business improves.

CLAY-COATED GAINS SHARE. Paperboard Packaging Council, which bases its figures on converting operations, reported clay-coated news accounted for 39% of total folding carton shipments in 1981 compared to 35.6% in 1980, while SBS's share dropped to 36% from 37.3%. Solid unbleached sulfate demand dropped 9.7% and SBS was down 4.5%, while clay-coated recycled was up 7.8%, despite a 6.7% drop in boxes made from other recycled paperboard. Some observers see this trend continuing in 1982.

U.S. Bureau of Census and API data for market shares in the folding carton industry, however, indicated SBS did not lose market share in 1981, and that solid bleached would continue to be the leading grade consumed by the boxboard industry in 1982. Census reported SBS held 37.5% of the total 3.4-million-ton folding boxboard market in 1981, while the industry's consumption of clay-coated newsback accounted for just 36% of the market. SBS and clay-coated unbleached kraft board (SUS) together comprised 50% of the 1981 market compared to 42% in 1972.

Any inroads made by clay-coated recycled boxboard probably reflected competitive pricing, greater recession resistance of markets traditionally served by recycled boxboard, and the desire of packagers to reduce costs during the recession. Recycled boxboard mills have been able to reduce prices because of the sharp drop in their wastepaper costs over the past couple years, but this advantage could be a temporary one if wastepaper prices begin to rise with an improvement in the economy in 1983.

PRICE GAP. Posted price for 20-pt clay-coated folding boxboard was maintained at $425/ton in late 1982, although considerable discounting was reported. SBS producers dropped prices on 16-pt and higher calipers of bleached boards to $590/ton in September 1982, essentially cancelling a July 1, 1981, price increase. And 16-pt coated SUS price was dropped $25/short ton in September to $475/ton.

While observers are uncertain if clay-coated or SBS will edge ahead in the market in 1983, they generally agree the lower grades of recycled paperboard are likely to continue to decline while clay-coated and SBS will expand into that market. Demand for clay-coated is expected to increase 3% to 4% in 1983, and show moderate growth over the next five to ten years if the price remains at least 11% below that of bleached board, according to one industry observer.

RECYCLED PROSPECTS. St. Regis Paper Co. president Edward J. McMahon said that clay-coated "turned the corner in 1981" and should continue to improve. Indicative of this trend is one converting firm which by the end of the first quarter of 1983 expects to be using 60% recycled and 40% of SBS in its operation, compared to a ratio of 57%/43% in the final quarter of 1982 and 50%/50% earlier last year.

If the economy recovers next year, SBS production might turn around, however, because items normally packaged in bleached boards, such as frozen foods and expensive toiletries, normally do better in a robust economy, observers indicate. Sid Pope, Federal Paper Board Co. treasurer, indicated, however, that it would take some time to work off high inventories of SBS, while recycled inventories should be normal at the beginning of 1983. ■

Newsprint, market pulp mills face year of slow recovery from slump

■ Canada's largest industry suffered a serious setback in 1982, enduring a combination of poor utilization rates, widespread red ink and loss of market share in important markets.

In some sectors of the paper industry, these losses will be recouped in 1983, but on the whole, Canadian mills in 1983 will find themselves producing at a level no higher than they experienced in 1978. And for genuinely healthy operating conditions, much of Canada's pulp and paper industry will have to wait until 1984 and beyond.

The industry's two biggest sectors, newsprint and market pulp, were probably hardest hit. Domtar Pulp & Paper Products Group president Roger Ashby predicted newsprint operating rates for Canada would average as low as 80% in 1982 and 83% in 1983, and he doesn't expect the country's market pulp operating rate to top its current 80% to 85% range until well into 1983, possibly as late as the fourth quarter. Jones Heward & Co. analyst Brian Topp thinks market pulp operating rates could average as low as 80% for the year.

The same general picture is true for other sectors of the Canadian industry. Shipments of coated groundwood dropped about 10% in 1982 and Ashby doesn't expect much improvement in 1983, with operating rates around 80%. Uncoated free-sheet demand in Canada should remain unchanged in 1983, he believes, although the operating rate for that sector could reach 85% "mainly through a somewhat stronger export effort."

That pattern of poor performances in 1982 and little or no rebound in 1983 is repeated in every sector of the Canadian economy. With British Columbia's forest products and mining industries especially hard hit by the recession, the Conference Board of Canada forecasts that unemployment in that province will top 14% in 1983. Quebec's unemployment rate will approach 16%, according to the research group.

And for Canada as a whole, with real gross domestic product (GDP) rising only 2.3% after a 4.8% drop in 1982, the Conference Board sees unemployment climbing to 12.7% from 10.9% last year. With 7.7% inflation and a double-digit prime rate on top of the expected unemployment numbers, economic conditions are sure to spawn calls for tougher government action against the recession, including anything from wage/price and currency controls to stimulative fiscal policy—confusing the business outlook even further.

Not all of the economic news will be bad this year, observers note. Pemberton Securities Ltd. analyst Jack Puusepp predicted that British Columbia paperworkers, the focus of the country's labor talks this year, "will be fortunate to get any wage increase in the new contract year beginning June 1983."

If he is right, that will be—for mill owners—a welcome change from recent double-digit settlements, including the 15%/13% contract mills were forced to sign in 1981. Moderation was already showing up in the eastern Canadian talks in mid-1982, when unions settled for wage hikes of 12% in the first year and 10% in the second, in contrast with a 17%/10% settlement in the previous contract.

Another sign of a changing attitude on the part of union members was the agreement of CIP Inc. box plant workers to accept a 10%/9%/7% pact in defiance of union leadership during a nearly industrywide strike.

But Canadian firms trying to sell overseas were dealt a serious blow in the fall of 1982 when Sweden and Finland pushed through major currency devaluations clearly—and successfully—designed to improve the competitiveness of their pulp and paper industries' exports. "In our opinion, the devaluation of the krona has rendered the coastal British Columbia mills less competitive," Puusepp notes. "Our estimates indicate that pulp from coastal mills in British Columbia will have a C$40/metric ton competitive cost disadvantage with Swedish pulp delivered to Rotterdam," he adds, indicating that interior British Columbia and southern U.S. mills do remain more competitive.

Puusepp feels Canada's dollar will remain around US$0.80 for most of 1983, protecting Canada's currency advantage for sales into the U.S. But Bowater Sales Corp. vice-president Wayne Mangels believes the Canadian dollar could rise as high as US$0.83 or US$0.85, which would hurt Canadian products in the U.S.

Clearly, the impact of such a trend on Canada's competitiveness in Europe would depend on what happens to Scandinavian currencies. Puusepp noted that "a further devaluation of European currencies, relative to the U.S. dollar, is not expected." He also pointed out that "Canada's experience with a devalued currency indicates that the benefits have been squandered away in the form of significantly higher wages. Similarly, we expect that the benefits of devalued Scandinavian currencies to their domestic economies will be temporary."

Canada's domestic fight against inflation also has a great deal to do with the future of its dollar, and thus of its export industries. The Conference Board's 1983 consumer price index forecast of a 7.7% increase is down from an 11% estimate for 1982, indicating some progress is being made.

On the other hand, the group is forecasting that "finance company 90-day rates" will drop only slightly from 1982, to 12.59% from 14.72%, leaving an actual increase in real interest rates from just under 4% to just under 5%. That is sure to fuel inflation and restrict economic recovery while it may attract some foreign money and boost the Canadian dollar, one analyst noted.

Other aspects of Canada's economic outlook are equally clouded. Domtar's Ashby pointed out that "opinion is still out on whether the federal government's 6% and 5% guidelines will be supported sufficiently well to bring these increases under control. The business community is giving strong support to the program and I wish we could say the same for labor, particularly the public sector unions. It's going to be a tough year."

MARKET PULP

Off year for market pulp mills

Strong dollars, devalued Swedish kronas and Finnish markkas, and a serious worldwide recession pushed the market pulp industry into a steep slide in 1982, and most observers believe it will take until 1984 for the industry to work itself completely out of the slump even if North American and European economies rebound strongly this year.

Operating rates for the Norscan region as a whole will average only 83.7% in 1983, up from 78.7% in 1982, according to Pemberton Securities Ltd. analyst Jack Puusepp. And Domtar Pulp & Paper Products Group president Roger Ashby thinks it could be as late as the fourth quarter of 1983 before the Canadian operating rate rises above its present range of 80% to 85%. Puusepp estimates Norscan production dropped 10.3% in 1982, and should recover by only 6.7% in 1983." Bowater's Mangels feels that demand worldwide will rise by 4% to 6% in 1983.

The impact of such low operating rates on pricing has been devastating. Northern bleached softwood kraft pulp delivered to Northern Europe—the industry's bellweather grade and destination—reached US$545/metric ton in 1981, and according to Jones Heward & Co. analyst Brian Topp, bottomed out in the fourth quarter of 1982 at $400 to $410. But Topp doubts it will rise as high as $520 before the fourth period of 1983 and doesn't think it will return to $545 before 1984. Smith Barney, Harris Upham & Co. analyst George Adler expects prices to start to recover slowly by the spring of 1983, returning to $545 within 12 months. Bowater Sales Corp. vice-president Wayne Mangels believes that prices should start up again by the second quarter of 1983.

Prices were already down and falling in the autumn of 1982 when the Swedes and Finns devalued their currencies by 16% and 10% respectively. After that, Scandinavian mills began cutting prices aggressively, and by year's end prices had reached the point in some areas where North American mills suffering under the burden of overvalued currencies were walking away from some business. MacMillan Bloedel Ltd. chairman Calvert C. Knudsen said Scandinavian mills were using the currency devaluation to put "tremendous pressure on European pulp prices, which could result in driving North America out of a substantial share of a traditional MacMillan Bloedel market."

BC Timber Ltd. president John Montgomery, in announcing in November 1982 the indefinite shutdown of his company's Prince Rupert, B.C., pulp mill, said the facility wouldn't start up again until markets improve—probably not before the second quarter at the earliest. "We are now operating in a fiercely competitive world pulp market where selling prices are at about the same level as they were in 1975. In the meantime, our total manufacturing costs (in British Columbia) for wood fiber, labor, chemicals, and hydro have more than doubled in the same period. Like virtually every other North American pulp exporter, we have been caught in a cost/price squeeze that is largely beyond our ability to control." British Columbia pulp was thus uncompetitive with Scandinavian pulp in Europe following the devaluations, he added.

PAPER-GRADE MARKET PULP PRODUCTION AND OPERATING RATES (000 metric tons)

	Production 1983	Production change 1982-83 (%)	Operating rates 1982	Operating rates 1983
U.S.	4385	4.0%	85.3%	87.4%
Canada	5880	7.5	80.2%	84.5%
Sweden	2790	10.1	70.5%	77.9%
Finland	1705	5.0	75.6%	85.3%
Norway	110	10.0	45.5%	50.0%
Total	14,870	6.7	78.7%	83.7%

Source: Jack Puusepp, Pemberton Securities, Ltd.

Even with discounting in NBKP, some paper mills were switching from northern to southern fiber to save still more money on pulp, further eroding the pricing structure. Ashby notes that a portion of the chaos in pricing also resulted from the effect of integrated U.S. mills that, as paper demand weakened, began to push unneeded pulp onto the market—with the result, Smith Barney's Adler estimates, that the operating rate of traditional U.S. market pulp mills in 1982 averaged below 80%.

By some point in 1982, many North American pulp mills that were still taking orders could be considered to be losing money on exports. Topp estimates that coastal British Columbia mills were losing about $80/metric ton on their overseas shipments in late 1982 and he expected the average for 1983 to be about the same. Interior B.C. mills, he believes, will lose more than $10/ton this year on export business but will continue to be marginally profitable on the minor amounts they ship to the U.S.

The most efficient eastern Canadian mills may make about the same amount on U.S. shipments as their interior B.C. competitors, according to Topp, but will lose $20/ton on overseas shipments. Those losses will diminish as the year goes on, Topp believes, but Puusepp noted that a great deal depends on whether the U.S. dollar weakens in 1983.

European demand for North American pulp will be "extremely weak" in the first half of the year, Puusepp cautioned, with Europe's needs increasingly being satisfied by Scandinavian producers, barring the weakening of the dollar. Puusepp also sees Latin American demand as depressed throughout the year, "as many nations in the area will be forced into currency devaluations and lagging their recovery."

While overseas demand will remain weak through at least the first half of the year, most observers think U.S. demand won't be a lot better. Assuming a 2.5% to 3.5% growth in the U.S. real GNP, most paper industry executives think uncoated free-sheet shipments will grow at a matching rate, while coated paper shipments will rise by slightly more than the top end of that range, and tissue shipments by about 3%.

Furthermore, producer inventories in the U.S. and overseas are still close to the peak of the current cycle. Mangels thinks Norscan inventories, at 1.8 million tons at the start of the year, will drop to around 1.4 million tons at year's end, while Smith Barney's Adler believes they could fall as far as 1.2 million. Topp fears they may have to drop farther than that, however, to recover the $545 price by early 1984.

On the other hand, Ashby noted that consumer inventories are very low and "as producer inventories drop to normal levels, we will see a price turnaround."

One positive result from the current weakness has been the postponement or cancellation of a number of planned capacity expansions. Adler noted that U.S. capacity will rise by only 1.9% in 1983, and despite the doubling of

Northwood's capacity in December 1982, Canadian capacity will only increase 2% this year. Kimberly-Clark "has decided not to add to its pulp capacity at this juncture," he pointed out, while an increase in market pulp capacity at International Paper Co.'s Georgetown, S.C., mill "will have relatively little impact in 1983, with the major addition occuring in 1984." Also, Great Northern Nekoosa's Leaf River mill will not be coming on-line until 1984.

As a result, according to Puusepp, "the one product in the forest products sector which offers the best prospects in the next five years is that of market pulp. It is the only area where shortages may appear."

NEWSPRINT

Bottom of market reached

Canada's newsprint mills are sunk in a near depression and will remain in that condition for most of 1983, but most observers believe the situation has reached bottom and won't get much worse. Assuming a rebound in the U.S. economy, consumption should increase roughly in pace with real GNP setting the stage for a modest upturn in operating rates as the year goes on.

Estimates for U.S. consumption in 1982 ranged from 9.9 million metric tons in the case of Pemberton Securities analyst Jack Puusepp to 10.16 million tons in the case of Bowater Sales Co. marketing vice-president Wayne Mangels. Domtar Pulp & Paper Products Group president Roger Ashby thinks 1983 consumption could be as low as 10.2 million tons, while CIP Inc. senior vice president W.P. Woodworth places it at 10.5 million tons.

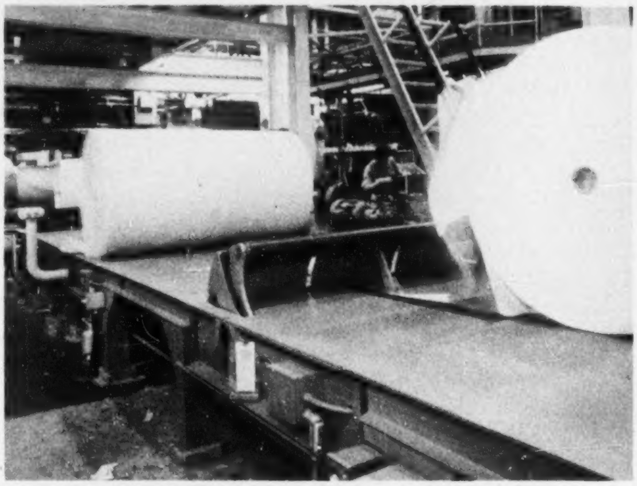
With consumption rising only 2% to 4% and capacity still rising—by 2.3% in the U.S. in 1983 and by 4.5% in Canada—operating rates should remain low. Mangels thinks operating rates will drop from 82% in 1982 to 80% in 1983 in eastern Canada, while Puusepp believes the British Columbia rate will drop from 65% in 1982 to 63.2% in 1983.

Ashby expects a U.S. operating rate of 90% in 1982, rising to about 92% in 1983. That relative strength of U.S. mills points up the key problem of the Canadian industry in 1983: while Canadian mills and U.S. producers have both added capacity at a rapid clip in recent years, U.S. firms gain share in a loose market. Canada should supply only 55% to 56% of U.S. newsprint in 1983, down from 66% just five years earlier. On the other hand, U.S. mills can't afford to become complacent: Ashby warned of a possible return of Scandinavian tonnage to North America due to recent currency devaluations and overcapacity.

Also, part of the increase in consumption will come not from a boost in purchases but rather from a draw-down in inventories, Topp noted. CIP's Woodworth projected a drop in inventory levels from 42 days of supply at the beginning of 1983 to "40 days or less" at the end of the year.

With demand growing at a slow pace and inventory reductions continuing throughout much of the year, price increases will be difficult to get during the year, and indeed Ashby noted that "we feel we'll be lucky to hold level through 1983." Topp forecasts a slight drop in average prices in 1983, to US$480 from $485 in the U.S. and to C$520 from $525 in Canada. Any increase in prices is unlikely before the fourth quarter of 1983, he adds.

On the other hand, Mangels sees prices actually rising by 5% on average—although they will still trail cost increases of 7%, he feels. Topp thinks moderate 1983 settlements in the usually volatile B.C. labor negotiations will keep cost increases to about 6%—compared with 16% in 1982. Puusepp commented that "in Western Canada, the paperworkers will be fortunate to get any wage increase in the new contract year beginning June 1983."



CANADIAN OVERSEAS NEWSPRINT SHIPMENTS
(000 metric tons)

	1982e		1983e	
Destination	**Volume**	**% change year ago**	**Volume**	**% change year ago**
Western Europe	775	6.2%	840	8.4%
Latin America	470	−24.8	515	9.6
Asia	177	−50.3	210	18.6
Oceania	84	−13.4	95	13.0
Africa	53	n.a.	55	3.8
Total	1560	−13.8	1715	9.9

n.m. = not meaningful.
Source: Jack Puusepp, Pemberton Securities Ltd.

Ashby, agreeing with Topp's estimates for 1982 and 1983 cost increases, noted the current pricing outlook "puts a severe squeeze on us from the margin standpoint." He added that "opinion is still out on whether the federal government's 6% and 5% guidelines will be supported sufficiently well to bring these increases under control."

While costs increases should outstrip prices, the Canadian industry will continue to get help from that country's weak currency, with most observers expecting the Canadian dollar to remain between US80¢ and US82¢. A weak currency gives Canadian mills a profit cushion in selling into the U.S. and in overseas markets where they compete head-to-head with Scandinavian producers benefiting from substantial currency devaluations in 1982.

Woodworth believes Europe and Southeast Asia look "promising," with about a 10% increase in shipments possible, while Puusepp forecasts an 8.4% increase in Canadian shipments to Western Europe and a jump of 18.6% to Asia because that continent "has been the most depressed" as a newsprint market. Mangels, pointing to Europe and Latin America as the most promising, fears shipment levels still won't go up at all, however—and he thinks the Canadian dollar could climb as high as US85¢, which most observers agree would hurt Canadian exports.

Koplik Overseas Ltd. newsprint vice-president Juan Carlos Fogth tagged Central and South America and Southeast Asia—especially Singapore, Indonesia, and Malaysia—as the most promising markets. He thinks "the Far Eastern markets such as Taiwan and Hong Kong will be dominated by Japanese suppliers who have the advantage of favorable freight rates and a record low rate of exchange.

"The European market will be difficult at best because of Scandinavia's devaluations," although "a weak Canadian dollar would help to offset the Scandinavian devaluation advantage." He still said it will take an "uphill battle to maintain existing markets" against overseas competitors, however, with new domestic capacity in India and Argentina also diminishing two previously strong markets for Canadian newsprint.

Long-term problems face the Canadian industry aside from the need to find healthy overseas markets. Topp predicted the construction of more "political" mills in the next few years—mills, he said, such as the proposed Matane Peninsula mill in Quebec, backed by the Quebec government partially to spur employment in the region.

While that is complicating the current overcapacity picture, Topp added that a number of Canadian companies face a looming increase in tax liabilities and may want to reduce that exposure by modernizing further, by increasing capacity or by upgrading capacity to produce groundwood specialties—especially with the possibility that companies may want to launch spending programs in the next two years for fear they will lose federal modernization subsidies should the Conservatives win the next election.

UNCOATED GROUNDWOOD

Modest demand rebound ahead

Uncoated groundwood mills should benefit in 1983 from an expected recovery in demand for business papers plus continued strength in commercial printing, observers agree, but excess capacity among newsprint and lightweight coated paper mills that compete with uncoated groundwood producers could keep operating rates artificially low, depressing prices for most of the year.

Sometimes seen as a "second choice" grade for customers unable to buy enough newsprint or LWC—as well as being an upgrade option for old newsprint machines—uncoated groundwood seems to face an increasingly confused future. By mid-decade, excess LWC and newsprint capacity should be mostly absorbed by the market, which should tighten up the groundwood supply/demand equation and produce healthy profit margins. But at the same time, a number of old Canadian newsprint machines will become unable to compete economically with newer units, raising the possibility that enough of them could be upgraded to uncoated groundwood to partially destabilize that market just when conditions would otherwise be looking up.

CIP Inc. senior vice-president W.P. Woodworth expects "continuing upgrading to some degree" in coming years, but few observers see widespread, major conversions in 1983-84 other than Abitibi-Price's conversion of Beaupré, Que., to produce 145,000 metric tpy of such grades as groundwood forms paper starting in 1983. Capital spending budgets have been held to a bare minimum, and most analysts agree with Woodworth that it will be a year or two before groundwood mills return to fairly full operating rates.

Mills producing top-quality uncoated groundwood publication papers, such as the supercalendered sheets made by Madison Paper Industries, St. Regis Paper, and CIP Inc., will have difficulty keeping their machines running full-out for as much as another two years, Jones Heward & Co. analyst Brian Topp believes, since demand will be weak and LWC capacity will be in excess for at least that long.

And even Wayne Mangels, vice president-marketing of Bowater Sales Co., who expects SC markets to tighten up by 1984, warns: "I think Finland intends to supply increasing amounts of SC clay-filled sheets" to the North American market.

Uncoated groundwood prices will remain soft as long as the whole publication paper market is soft, Mangels warned. But he and other observers expect to see a strong performance by forms, inserts, and commercial printing, pushing consumption up 3% to 4% in Woodworth's view and as much as 4% to 5% in Mangels' opinion, after a drop of 2% in 1982.

Topp believes North American operating rates will average slightly below 90% in 1983, up two or three points from 1982, although Woodworth thinks that the rate for Canada will not exceed the "low-80s to mid-80s." Mangels notes that surplus LWC should siphon off some insert business from high-brightness uncoated groundwood.

Mangels also believes lightweight uncoated groundwood paper consumption will rise 3% in 1983. Most observers think lightweight grades could become more competitive in the next few years, with Consolidated-Bathurst having started up a new 69,000-metric-tpy directory and forms paper machine at Trois Rivières, Que., in 1982—and with the coming breakup of American Telephone & Telegraph adding an element of confusion about how many companies will be buying directory paper in the future. ■

WASTEPAPER

Record low prices; nowhere to go but up

■ Wastepaper glutted the market for most of 1982 and mills paid historically low prices. In the last quarter of the year, however, supplies began disappearing as collectors became discouraged by low prices and generating mills and converting plants took substantial downtime.

In November, it appeared as though No. 1 news, old corrugated containers, and pulp substitutes markets were strengthening, leading many market observers to feel these grades would lead the others out of the slump.

But this apparently was due not to any substantial

Canadian labor focuses on West

■ Focus of Canadian contract talks moves to the West Coast from the East this year. In British Columbia, 16 companies with 20 pulp and paper mills will be going to the bargaining table, while in eastern Canada only two companies with three mills have labor contracts expiring.

Negotiations should differ drastically from talks held when the former contract expired June 30, 1981, because companies can no longer afford the hefty wage settlements of previous years. In fact, the wage increase in 1983 is likely to be zero, according to Don Saunders, president of the Pulp & Paper Industrial Relations Bureau, which is bargaining agent for 15 of the B.C. companies involved in labor talks this year. "The industry just doesn't have the capacity to increase any of its costs," said Saunders.

B.C. producers took substantial downtime in 1982 in both the pulp and paper and the wood products industries, and unemployment at pulp and paper mills was about 25% late in 1982, while about one-third of all forestry workers were laid off, he noted. Sawmills are expected to run better in 1983 due to an increase in housing starts that began as interests rates declined late in 1982, but the pulp and paper industry will have a flat year, said Saunders.

NONMONETARY IMPROVEMENTS. Rather than higher wages, unions will probably have to settle for nonmonetary improvements in contracts in such areas as management rights, work contracted out, job security, extended recall rights and supplemental unemployment insurance payments, he explained.

CANADIAN PAPER INDUSTRY 1983 BARGAINING CALENDAR

Company	Mill location	Union*	Contract expires
British Columbia			
BCFP	Crofton	CPU,PPWC	6/30
	Mackenzie	CPU	6/30
BC Timber	Castlegar	PPWC	6/30
	Prince Rupert	PPWC	6/30
Canadian Forest	Port Mellon	CPU	6/30
Cariboo	Quesnel	CPU	6/30
Crestbrook	Skookumchuck	PPWC	6/30
CZ Canada	Campbell River	CPU	6/30
Eurocan	Kitimat	CPU	6/30
Finlay	Mackenzie	CPU	6/30
Intercontinental	Prince George	CPU, PPWC	6/30
MacMillan Bloedel	Nanaimo	PPWC	6/30
	Port Alberni	Other	6/30
	Powell River	CPU	6/30
Northwood	Prince George	CPU, PPWC	6/30
Prince George	Prince George	CPU, PPWC	6/30
Western Forest	Port Alice	CPU	6/30
	Woodfibre (Squamish)	PPWC	6/30
Tahsis	Gold River	PPWC	6/30
Weyerhaeuser	Kamloops	PPWC	6/30
Scott Paper	New Westminster	CPU	6/30
Eastern Canada			
Rolland	Mt. Rolland, Que.	CPU	4/30
	St. Jerome, Que.	CPU	4/30
Prince Albert	Prince Albert, Sask.	CPU	7/31

*CPU=Canadian Paperworkers Union; PPWC=Pulp, Paper & Woodworkers of Canada.

Art Gruntman, Canadian Paperworkers Union West Coast vice-president, said the union is waiting until the spring to decide its goals in 1983, but noted that it would hinge on the condition of the industry when talks start. A priority of the union, however, will be getting a shorter work week. Gruntman said this would keep production in line with demand and reduce unemployment. The union will also seek improvements in pension plans, which have remained unchanged for four years.

The attitude the industry is likely to take in 1983 negotiations was demonstrated late in 1982 when companies refused to extend an 18-month limitation on worker recall rights. Recall rights guarantee that former workers who are laid off will be recalled before new applicants are hired. The companies indicated that to extend those rights would cost more because rehired workers have more seniority rights than new people. When the unions agreed to waive all seniority rights of recalled workers, the industry still refused to grant the request.

ONE-YEAR SETTLEMENT. If the union feels it cannot negotiate a contract to its liking, it will settle for what it feels it can get, but the term of the new agreement will be one year instead of two, said Gruntman, who feels strikes are not likely to happen unless industry operating rates improve substantially when talks start.

There will probably be as many as 10,000 workers less represented in 1983 negotiations than there were two years ago due to extensive layoffs, said Gruntman. He expects closer to 50,000 workers, members of CPU as well as the Pulp & Paper Workers of Canada and International Woodworkers of America, will be involved in the 1983 talks compared to 60,000 members in 1981, when the industry was operating nearly at capacity.

Following a six-week strike in the summer of 1981 B.C. unions got a two-year contract calling for wage increases of 15% the first year and 13% the second year. Last year, the CPU negotiated contracts in eastern Canada calling for wage increases of 12% the first year and 10% the second year, bringing the base wage in 1982 to C$11.38 in the East compared to C$12.96 in B.C.

If a one-year contract calling for lower wage increases is negotiated on the West Coast this year, it might not only achieve the Eastern region's goal of wage parity with the West, but also cause most of the industry's labor agreements to come up for renewal in 1984.

MODERATING TREND IN U.S. In the U.S., the trend toward lower wage increases and union concessions, which began in 1982 as industry conditions deteriorated, is likely to continue in 1982, observers say.

Some of the concessions won by the industry in 1982 include giving management more flexibility in running the mill, establishing labor-management committees to study ways to reduce health costs, and wage increase deferrals, according to American Paper Institute's employee relations vice-president Richard P. Klinzing.

Wage settlements in the pulp and paper industry during the first ten months of 1982 showed a moderating trend, averaging 7.1% across the country compared to yearly averages of 8.7% in 1981 and 9.2% in 1980. Wayne E. Glenn, president of the United Paperworkers International Union, feels that the settlements in 1983 will range from 6% to 7%. Labor expert and P&P columnist Julian Kien agrees, noting that unemployment is likely to remain at about 10% and pulp and paper profits will continue to be weak.

PRODUCTIVITY UP. Kien also feels that employers will continue to negotiate productivity improvements through contract changes and work schedules. For the first nine months of 1982, productivity in the pulp and paper industry was 0.9% higher than in the same period in 1981, a higher increase than the 1980-81 change, but lower than in previous years, according to Klinzing.

John Nee, group director of employee relations at St. Regis Paper Co., feels that both companies and unions will want to ratify three-year agreements in 1983 because

MAJOR CONTRACTS BY REGION ON 1983 U.S. PAPER INDUSTRY BARGAINING CALENDAR

Company	Mill location	Union	No. of employees	Contract expires
New England Region				
Diamond	Hyde Park, Mass.	U	217	1/1
James River	Jay, Maine	U,O	189	6/1
Boise Cascade	Rumford, Maine	U	1276	6/30
Federal	Sprague, Conn.	U	182	7/10
Eastern Region				
Simpson	Miquon, Pa.	U	270	2/14
Scott	Fort Edwards, N.Y.	U,B,O	488	3/31
Penntech	Johnsonburg, Pa.	U,O	593	4/10
St. Regis	Deferiet, N.Y.	U,A,O	597	5/1
James River	4 New Jersey (Riegel) mills	U	739	5/31
Intl. Paper	Ticonderoga, N.Y.	U	700	6/1
Finch, Pruyn	Glens Falls, N.Y.	U,A,B,O	625	6/15
Container Corp.	Philadelphia, Pa.	U	305	6/19
Hammermill	Lock Haven, Pa.	U	689	6/20
Diamond	Plattsburgh, N.Y.	U	280	8/1
Georgia-Pacific	Lyons Falls, N.Y.	U	218	8/10
St. Regis	York, Pa.	U	201	9/22
Appleton Papers	Roaring Springs, Pa.	U	399	11/17
Westvaco	Luke, Md.	U,B,O	1421	12/1
Midwest Region				
Pentair	Niagara, Wis.	U,O	548	1/31
Procter & Gamble	Green Bay, Wis.	U	1532	4/30
James River	Ashland, Wis.	U	162	5/1*
Port Huron	Detroit, Mich.	U	182	5/1
Port Huron	Port Huron, Mich.	U	249	5/1
Scott	Marinette, Wis.	U	607	5/14
Green Bay Pkg.	Green Bay, Wis.	U	124	5/31
GN Nekoosa	Nekoosa, Wis.	U,A,O	753	5/31
GN Nekoosa	Port Edwards, Wis.	U,A,O	917	5/31
Nicolet Paper	De Pere, Wis.	U	329	5/31
Mead	Escanaba, Mich.	U,A	876	6/1
Packaging Corp.	Rittman, Ohio	U	371	6/1
St. Regis	Sartell, Minn.	U	330	6/1
Container Corp.	5 Midwest mills	U	400	6/19
Blandin Paper	Grand Rapids, Minn.	U	965	6/30
Flambeau	Park Falls, Wis.	U	515	7/31
Champion	Hamilton, Ohio	U	1517	9/14
Procter & Gamble	Cheboygan, Mich.	U	483	9/26
Weston Paper	Terre Haute, Ind.	U	156	10/21
Diamond	Lockland, Ohio	U	280	11/1
Sorg Paper	Middletown, Ohio	U	595	11/1
Plainwell	Plainwell, Mich.	U	236	12/1
Southern Region				
Gulf States	Demopolis, Ala.	U	381	1/6
Hammermill	Selma, Ala.	U,B	185	3/6 7/6
Buckeye	Foley, Fla.	U	790	3/14
Champion	Pasadena, Texas	U	1196	5/29
Container Corp.	Fernandina Beach, Fla.	U,A,B	636	5/31
Georgia-Pacific	Palatka, Fla.	U,A,B	1319	5/31
Intl. Paper	Multiple mill group	U,A,B	7632	5/31
Scott	Mobile, Ala.	U,B	2750	5/31
Union Camp	Savannah, Ga.	U,A,B,O	1625	5/31
Gilman Paper	St. Marys, Ga.	U,A,B	771	6/5
Georgia-Pacific	Crossett, Ark.	U,A	1674	6/12 6/30
Champion	Courtland, Ala.	U	997	6/15
Continental	Port Wentworth, Ga.	U,A,B,O	443	6/19
Continental	Hodge, La.	U	660	6/30
ITT Rayonier	Fernandina Beach, Fla.	U,B	497	6/30
ITT Rayonier	Jesup, Ga.	U,A,B,O	1151	6/30
Manville Forest	West Monroe, La.	U	996	6/30
St. Regis	Lufkin, Texas	U,A,B	860	6/30
Alton Packaging	Jacksonville, Fla.	U,B	316	6/30
Westvaco	Wickliffe, Ky.	U	353	6/30
Bowater Southern	Calhoun, Tenn.	U,B	1160	7/2
Boise Southern	DeRidder, La.	U	477	7/14
Abitibi-Price	Augusta, Ga.	U	188	7/27
Brunswick Pulp	Brunswick, Ga.	U	730	7/31
Augusta Newsprint	Augusta, Ga.	U	188	7/27
Crown Zellerbach	Bogalusa, La.	U,B	762	7/31
Kimberly-Clark	Memphis, Tenn.	U	1059	7/31
Potlatch	McGehee, Ark.	U	235	7/31
Temple-Eastex	Evadale, Texas	U,B	877	7/31
Weyerhaeuser	Plymouth, N.C.	U,B,O	1576	7/31
Continental	Augusta, Ga.	U,B	768	8/14
Weyerhaeuser	Pine Bluff, Ark.	U	181	8/17
Georgia Kraft	Macon, Ga.	U,A,B	470	8/27
Georgia Kraft	Rome, Ga.	U,A,B,O	660	8/27
Champion	Roanoke Rapids, N.C.	U	451	8/31
Willamette	Hawesville, Ky.	U	296	8/31
Federal	Riegelwood, N.C.	U	1180	9/8
Kimberly-Clark	Coosa Pines, Ala.	U,A,B,O	1330	9/14
Owens-Illinois	Valdosta, Ga.	U,B	360	9/15
Great Southern	Cedar Springs, Ga.	U,B	645	9/30
St. Regis	Monticello, Miss.	U	415	9/30
Olin	Pisgah Forest, N.C.	U	1908	10/5
Bowater Carolina	Catawba, S.C.	U	713	10/29
James River	Naheola, Ala.	U,B	1349	10.31
Georgia Kraft	Mahrt, Ala.	U	289	10/31
Inland	New Johnsonville, Tenn.	U	150	10/31
Interstate	Riceboro, Ga.	U	248	10/31
Owens-Illinois	Big Island, Va.	U	251	10/31
Stone	Florence, S.C.	U	443	10/31
Union Camp	Montgomery, Ala.	U	443	10/31
GN Nekoosa	Ashdown, Ark.	U	999	11/1
Weyerhaeuser	Valliant, Okla.	U	236	11/14
Willamette	Campti, La.	U	198	11/15
Federal	Richmond, Va.	U	124	11/29
Westvaco	Covington, Va.	U	1208	11/30
Weyerhaeuser	New Bern, N.C.	U	357	12/19
St. Regis	Houston, Texas	U	426	12/31
Pacific Coast Region				
Kimberly-Clark	Fullerton, Calif.	W	625	3/15
Willamette	Albany, Ore.	W	312	6/1

U=United Paperworkers Intl. Union; A=Intl. Assn. of Machinists & Aerospace Workers; B=Intl. Brotherhood of Electrical Workers; W=Assn. of Western Pulp & Paperworkers; O=Other.

Source: American Paper Institute Employee Relations Dept.

of concern about the uncertain economy. He also feels that as the economy returns to normal, so will relations between employers and employees, and unions will no longer be willing to concede to companies' demands.

In the interim, however, 1983 could prove a volatile year for bargaining because a number of companies are contemplating closing marginal operations if the economy does not improve by mid-1983, said Nee. "Job losses and plant closures will only further induce conflict at the bargaining table," he pointed out. ■

ENVIRONMENT

Clean Air Act rewrite due in 1983

■ The U.S. pulp and paper industry in 1983 will be affected by developments in environmental regulation on three fronts:

1. Congressional review of the Clean Air Act under the act's ongoing reauthorization procedure, whereby industry could benefit from efforts in the House and Senate to both streamline the act and simplify industry's technology and permitting requirements;
2. Upcoming amendments to the Clean Water Act during reauthorization, including probable postponements in industry's 1984 compliance deadlines under the current act, and final rules by Environmental Protection Agency governing "best conventional technology" (BCT) requirements for control of conventional pollutants discharged from pulp and paper mills; and
3. Congressional amendment of the Resource Conservation & Recovery Act (RCRA) during reauthorization, which could broaden the scope of hazardous waste regulation, and upcoming regulation by EPA governing land disposal of hazardous waste and financial responsibilities for storage and disposal facilities.

AIR ACT AMENDMENTS. While the paper industry as well as the Reagan Administration hoped to pass legislation in 1982 to amend the Clean Air Act, the process has extended into 1983 due to the difficulty of reaching a House-Senate compromise and to last year's congressional postponement of action on the act due to the November elections. At year-end, the Administration abandoned hope for any rewrite in 1982 and planned to press for a limited extension of the act in the lame-duck session.

Major revisions of the act the paper industry would like to see include modification of the "prevention of significant deterioration" (PSD) program, which classifies areas that have attained national clean air standards into Class I, II, or III areas, depending on their degree of "clean air," and permits increments of pollution accordingly; abandonment of stringent lowest achievable emission rate (LAER) standards in nonattainment, or "dirty air" areas where national ambient air quality standards (NAAQS) have not been met; and making uniform technology control requirements which equate best available control technology (BACT) to new source performance standards (NSPS) where they exist.

The House version of a Clean Air bill, HR 5252, sponsored by Rep. Thomas A. Luken (D-Ohio), addressed the above three issues and essentially streamlined permitting procedures for new facilities. However, a controversial amendment has been added to the PSD provision which would restore the act's mandatory Class II areas—whereas the original language in HR 5252 would have dispensed with all Class II designations—and initial paper industry support for the bill has faltered.

The Senate bill, meanwhile, under direction of Sen. Robert T. Stafford (R-Vt.), chairman of the Environment & Public Works Committee, proposed several changes to the law last year which addressed acid precipitation control programs, interstate transport of pollutants, hazardous air pollutants, extension of deadlines to December 1985 for attainment of national standards for sulfur dioxide, particulate, and nitrogen dioxide, and streamlining state permitting procedures under the state implementation plan (SIP) process.

Stafford's committee also offered a package of amendments which could potentially expand Class I areas and mandate long-term air quality goals for large facilities emitting over 1000 tpy of any air pollutant. Nonattainment amendments would replace the LAER technology requirement with BACT and would waive the emission-offset requirement for facilities that would not comprise more than 1% of total emissions in a nonattainment area.

Thus, the clean air legislation that is emerging, judging by the areas of agreement between the Senate and House, will likely contain the following specific provisions:

- In attainment areas, no changes will be made to the PSD increment system in Class I areas, in fact, more areas may be studied to warrant such classification. States will likely have more say in determining Class I areas.
- In Class II areas, where most paper mills are located, the increment system of pollution allowance will not be eliminated, as paper industry lobbyists would prefer, but may have the daily increment allowance replaced with a yearly allowance.
- Attainment deadlines for states to achieve national air-quality levels, currently targeted for December 1982, will likely be extended to the mid- to late-1980s.
- Case-by-case determination of BACT will likely be required for new facilities emitting 500 tpy or more of air pollutants in both attainment and nonattainment areas of the country. It is also likely that BACT will be equated to NSPS for sources under the 500-tpy threshold.
- In nonattainment areas, LAER standards may be replaced by industry-supported BACT standards, thus simplifying control-technology requirements and giving states more flexibility to consider cost, energy and other factors in establishing control requirements.
- The visibility protection program will apply only when there is "significant" impairment rather than "any" impairment as in the current law.

Purchased fuel price hikes to slow

■ The 1983 outlook for pulp and paper industry energy prices is a good one. Successful conservation measures and reduced demand due to the worldwide recession have slowed price increases for fuel oil and natural gas—two high-cost sources of paper industry purchased energy.

Most analysts do not expect OPEC to be able to raise the price of crude oil above its 1982 $34/barrel benchmark level in the near future—indeed, downward pressure on prices for at least two years is expected by some. And the American Gas Assn. in November predicted that consumer prices for natural gas would rise only 5%/year between 1982 and 1987, while wellhead price increases would average 8%/year during the period compared with 16%/year between 1977 and 1982.

In addition, the paper industry continued to increase its dependence on self-generated and residue sources of energy in 1982, as it has over the past ten years. Self-generated and residue energy sources now account for nearly 53% of the industry's total energy consumption, up from 41% a decade ago (see table).

The bright energy picture does not extend to every region of the country, however. In the Pacific Northwest, electrical power customers were given a 58% rate hike last fall from the Bonneville Power Administration—a federal agency that generates hydroelectric power at Columbia River dams for the region. That rate increase was on the heels of a 67% rate hike in 1981, and the BPA plans to ask for another hike this year.

While direct customers, including Crown Zellerbach's Port Townsend, Wash., mill, will bear the brunt of the rate increase, indirect customers such as Weyerhaeuser Co., Georgia-Pacific Corp., and Boise Cascade Corp. will be affected as well, although to a much lesser degree.

MANDATORY COAL-SWITCH PRESSURES EASED. The regulatory burden facing the paper and other industry in the field of energy use has been eased somewhat by the Reagan Administration, and that trend should continue into 1983. Most recently, the Dept. of Energy in November revised its rules implementing the Fuel Use Act, making it clear that the DOE will not force existing boilers to be converted to coal use, as is currently possible under the Act. It is as close as the Administration has come to actual repeal of the FUA, which it intends to consider this year. Earlier, the DOE made it easier for owners of new industrial boilers to get exemptions from FUA's requirement of oil or gas use.

The outlook for cogenerators in the pulp and paper industry is brighter as well. Last June the Supreme Court upheld the constitutionality of the Public Utility Regulatory Policies Act (PURPA) by rejecting the state of Mississippi's argument that the law intrudes on state utility regulation. The High Court's decision on PURPA, a law that encourages cogeneration by exempting cogenerators from utilities regulation and directs utilities to pay fairly for cogenerated power, should serve to ease current uncertainties over cogeneration investment.

A second federal appeals court ruling, however, struck down Federal Energy Regulatory Commission rules requiring utilities to pay cogenerators full avoided costs for their power. American Paper Institute and the FERC have both requested Supreme Court review of the lower court's ruling.

Meanwhile, cogeneration bills which are supported by the paper industry are currently under consideration in both the Senate and the House. House bill HR 6500 would set the federal rate for utility purchase of cogenerated power at full avoided cost. It would also allow states to set avoided cost below the 100% ceiling if justified, and would require mandatory interconnection between utilities and cogenerators.

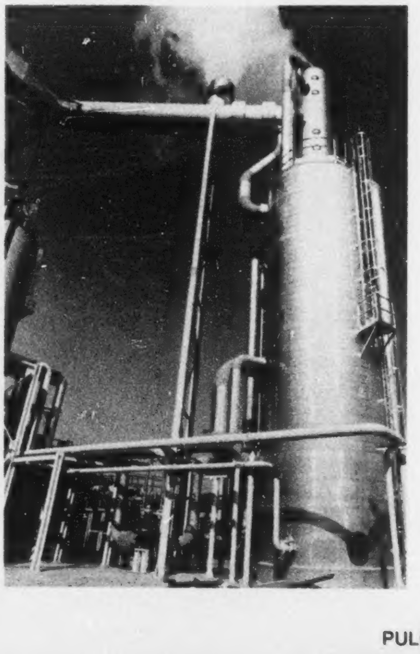
Senate bill S 1885 would reestablish a full avoided cost rate at the federal level for the sale of cogenerated power to a utility and make mandatory interconnections between cogenerators and utilities for the sale of cogenerated power.

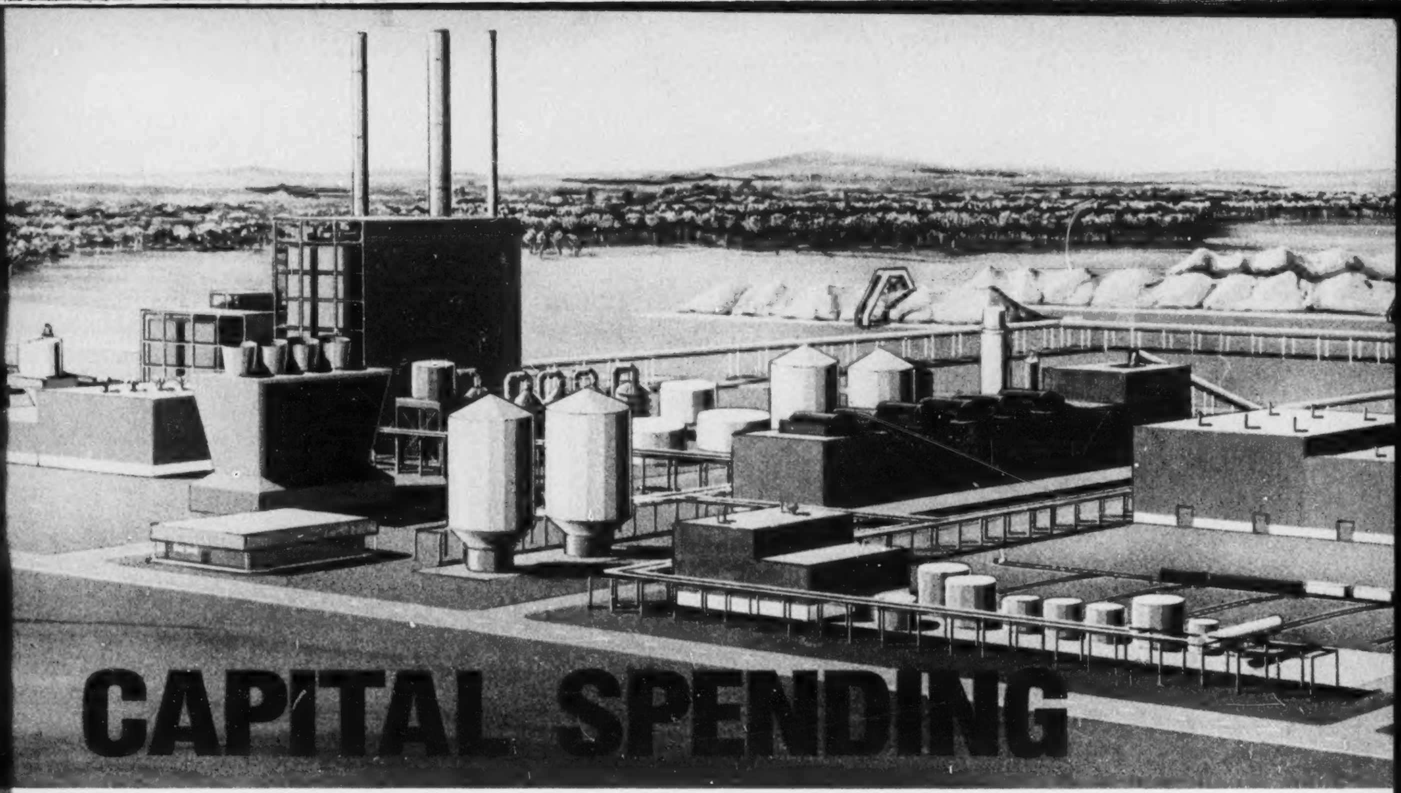
According to API, the paper industry supports the bill, except for the provision which would allow utilities to own 100% rather than 50% of cogeneration facilities eligible for PURPA benefits. ■

U.S. PULP, PAPER, PAPERBOARD INDUSTRY ESTIMATED FUEL AND ENERGY USE

Source	Third-quarter 1982	1981	1972
Purchased electricity	6.6%	6.8%	4.4%
Coal	12.1	10.8	9.8
Residual fuel oil	11.5	10.6	21.3
Distillate fuel oil	0.3	0.3	1.0
Natural gas	16.9	19.5	21.5
Other purchased energy	0.2	1.0	1.1
Total purchased fossil fuel and energy	**48.4**	**48.0**	**59.1**
Woodwaste	7.7	6.7	2.0
Bark	5.4	5.3	4.6
Spent pulping liquors	37.6	39.1	33.7
Self-generated hydroelectricity	0.5	0.6	0.4
Other self-generated	0.4	0.4	0.2
Total self-generated and waste fuels	**51.6**	**52.0**	**40.9**
Total energy	**100.0**	**100.0**	**100.0**

Source: American Paper Institute





Artist's rendering (above) is of new GNN/Leaf River Forest Products Inc. 350,000-tpy market pulp mill at New Augusta, Miss., one of two greenfield mills under construction in the U.S. targeted for 1984 start. (The other project is Union Camp's 210,000-tpy white paper mill at Eastover, S.C.)

CAPITAL SPENDING

Survey reflects lowered targets but reports $13.5 billion in planned spending in U.S./Canada, with 44 new paper/board machines, 67 major mill expansions

By STEPHANIE POLLITZER, Consulting Editor

☐ The current (end-1982) economic climate has put a damper on capital spending planning for expansion and modernization projects at U.S. and Canadian pulp and paper mills. Data compiled by Pulp & Paper for this annual review of the North American industry's spending programs list a grand total of just under $13.5 billion; this covers programs for the 1982-84 period and also includes $2 billion (about 15%) for projects to be completed in 1985 and later. The total reported a year ago was 15% higher, at $15.9 billion (which included $3.6 billion—22%—for projects to be completed after the 1981-83 period under review).

Stretchouts and indefinite postponements for planned projects have been announced by both U.S. and Canadian mills, but few projects have been cancelled outright.

Capital spending by U.S. mills during the year 1982 was expected to be about $5.96 billion, according to the last U.S. Commerce Dept. survey (taken in late October-November 1982). This is about 11.3% below the $6.72 billion spent in 1981. McGraw-Hill Economics' annual fall spending survey (November 1982) estimates 1982 spending at $6.2 billion. For 1983, the McGraw-Hill survey forecasts a 7% increase in U.S. pulp/paper industry spending to $6.63 billion.

Data from a mid-1982 Statistics Canada survey report an expected outlay by the Canadian industry of

REPORTED SPENDING 1982-84+, BY TYPE OF FACILITY[1]

UNITED STATES		
Wood/fiber	$ 454,780,000	6%
Pulping	1,648,314,000	20%
New machines	667,000,000	8%
Machine modifications	519,200,000	6%
Energy/power	2,289,095,000	28%
Miscellaneous/plant	1,795,056,000	22%
PRODUCTION TOTAL	$7,383,445,000	90%
Water quality	$ 365,258,000	4%
Air quality	459,949,000	6%
Solid waste/unspecified	15,203,000	0%
ENVIRONMENTAL TOTAL	$ 840,410,000	10%
TOTAL SPENDING[2]	$8,223,855,000	100%
CANADA		
Wood/fiber	C$ 185,135,000	3%
Pulping	1,833,286,000	35%
New machines	611,300,000	12%
Machine modifications	299,364,000	6%
Energy/power	608,776,000	12%
Miscellaneous/plant	1,122,203,000	21%
PRODUCTION TOTAL	C$4,660,064,000	89%
Water quality	C$ 316,187,000	6%
Air quality	275,230,000	5%
Solid waste/unspecified	2,312,000	0%
ENVIRONMENTAL TOTAL	C$ 593,729,000	11%
TOTAL SPENDING[3]	C$5,253,793,000	100%

1. Includes projects, as announced, for completion in 1985 and later (based on data reported to PULP & PAPER)
2. Total dollar figures includes estimated $1,292,000,000 for projects to be completed in 1985 and later.
3. Dollar total includes estimated C$697,000,000 for projects to be completed in 1985 and later.

C1.79 billion in 1982, down 16.5% from $2.14 billion in 1981.

Environmental spending. Programs for environmental control listed in the 1983 P&P survey represent 10% of total spending reported by U.S. mills (with 90% assigned to production-related programs). U.S. environmental spending reached a plateau in 1977 (to meet the 1977 standards), when it was 25% of U.S. total. In three of the intervening years, environmental spending has been 10% or 11% of total, with a "blip" up to 13% in the 1982 survey (for 1983 air-quality standards).

In Canada, environmental spending has run a steadier course—averaging 13% or 14% in the last seven surveys (1977 on) except for 16% in 1978 and 12% in 1980. The 1983 survey shows 13% of Canadian spending to be for environmental control (87% for production projects).

About the survey data. The tables and lists in this report are compiled from P&P's annual survey of expansion/modernization programs at U.S. and Canadian mills. Assignment of cost data to the various categories (for example: pulping, new machine, or energy/power) is based on information from the companies, if available, but in many cases reflects an estimate by P&P staff and should be considered as approximations.

The dollar figures represent the total cost of the reported projects and sometimes may include supporting equipment. The total cost is assigned to the startup year —not to year(s) of expenditure.

Every effort is made to have the P&P annual spending survey as complete and accurate as possible. Some companies make no public announcements of capital-investment programs, and other firms do not release financial information for announced programs. Thus it is recognized that P&P's survey data are incomplete.

Information is compiled from the many companies that do report their programs in detail, and also from other information that has been publicly released. The data do not normally include spending for woodlands nor for off-site converting facilities.

Basic rules that are followed by P&P staff in assigning cost data to the various categories include the following: recovery boilers are listed under "pulping" unless specifically identified as an "environmental" project; the large multi-million-dollar projects for a "new machine" or "greenfield mill" are divided into the appropriate categories, presuming a reasonable assumption of proportionate costs; "miscellaneous" includes identifiable stock preparation, coating and finishing operations as well as plant and building structure, and unidentifiable projects reported as "miscellaneous."

SEVEN-YEAR CAPITAL SPENDING TRENDS

UNITED STATES

P&P's reported 3-year spending ($, billion)

Year	Period	Production	Environment		Total	Annual capital expenditures[1]
			Water	Air		
1983	1982-84	$6.095[2]	$0.376[3]	$0.460	$6.931[2]	$(6.00)[4]
1982	1981-83	6.216[2]	0.635[3]	0.677	7.528[2]	6.30
1981	1980-82	7.783[2]	0.531	0.568	8.882[2]	6.54
1980	1979-81	8.003[2]	0.515	0.360	8.001[2]	6.80
1979	1978-80	4.911	0.350	0.251	5.759[5]	5.55
1978	1977-79	4.431	0.611	0.307	5.489[5]	4.41
1977	1976-78	3.455	0.783	0.433	5.001[5]	3.36

1. Based on data from U.S. Commerce Dept; data for 1978, 1979 and 1980 have been revised.
2. 1983 data does not include $1.292 billion for projects to be completed 1985 and later; 1982 data does not include $2.8 billion estimated for projects to be completed in 1984-86; 1981 data does not include $1.150 billion estimated to be spent in 1983-85; 1980 data does not include $0.877 billion estimated to be spent in 1982-85.
3. 1983 data includes $0.015 billion for 'solid waste/unspecified'; 1982 data includes $0.050 billion for 'solid waste.'
4. P&P estimate
5. Includes unallocated funds of $0.246 billion for 1979; $0.140 billion for 1978; $0.320 billion for 1977; $0.900 billion for 1976 surveys.

CANADA

P&P's reported 3-year spending (C$, billion)

Year	Period	Production	Environment		Total	Annual capital expenditures[1]
			Water	Air		
1983	1982-84	C$3.990	C$0.295	C$0.272	C$4.557[2]	C$(2.60)[4]
1982	1981-83	3.949[2]	0.438[3]	0.365	4.752[2]	2.83
1981	1980-82	3.645[2]	0.303	0.329	4.277[2]	3.06
1980	1979-81	2.440[2]	0.187	0.135	2.078[2]	2.11
1979	1978-80	1.462	0.110	0.113	1.685	1.55
1978	1977-79	1.442	0.166	0.112	1.720	1.26
1977	1976-78	2.169	0.189	0.157	2.548	1.29

1. Data from Statistics Canada; includes capital and repair expenditures for equipment and facilities.
2. 1983 data does not include C$0.697 billion for projects to be completed in 1985 and later; 1982 data does not include C$0.314 billion estimated for projects to be completed in 1984-86; 1981 data does not include $0.643 billion estimated to be spent in 1983-85; 1980 data does not include $0.684 billion estimated to be spent in 1982-85.
3. 1983 data includes C$0.002 billion, and 1982 data includes C$0.031 billion designated for 'solid waste' control.
4. P&P estimate.

UNITED STATES

South continues its leadership; energy projects get much attention

The recession-impacted returns for P&P's 1983 survey of spending plans at U.S. mills total $8.2 billion dollars. This is 20% below last year's $10.3 billion and the lowest total reported for the U.S. industry since 1979. The $8.2 billion figure includes $1.3 billion for projects to be completed in 1985 and later; it does not include programs which have been indefinitely postponed nor proposed programs for which no startup date has been set.

The South continues its lead over other U.S. regions in expansion plans and accounts for 63% of the spending reported in the 1983 survey (up from 60% last year, and 55% in 1980). Total spending reported for the South (three Census southern regions) is $5.2 billion. More than $1 billion is reported by two southern states: South Carolina ($1.3 billion) and Alabama ($1.1 billion). Mississippi is the third-ranking state ($920 million). Other leading southern states are Georgia ($657 million) and

TOP SPENDERS IN U.S.

Companies for which P&P reports capital spending plans of $100,000,000 or more, including production and environmental programs

	1982-84	**1981-83**
Champion International	$796,780,000*	$ 800,974,000*
Union Camp Corp.	744,800,000	803,900,000*
Weyerhaeuser	603,460,000	1,243,100,000*
International Paper	600,000,000	878,000,000
Great Northern Nekoosa	582,120,000†	176,349,000*
St. Regis Paper	556,862,000	820,638,000
Scott Paper	431,000,000*	395,500,000
Crown Zellerbach	420,000,000*	530,900,000*
Mead Corp.	331,200,000	440,200,000
MacMillan Bloedel Inc.	308,120,000	318,355,000
Independent Kraft	244,000,000	—
Augusta Newsprint/Abitibi	242,205,000	243,495,000
Federal Paper Board	237,496,000	175,130,000
Hammermill Paper	178,648,000*	274,346,000
Bowater North America	149,670,000	63,500,000
Pentair Inc.	115,271,000*	103,800,000
Continental Forest Ind.	115,000,000	262,000,000
Westvaco	100,000,000	140,000,000

*Includes programs for completion beyond 3-year period indicated.
†Includes Leaf River project, reported separately last year.

Total cost of a multi-year project is assigned to the year of startup.

SUMMARY OF U.S. PROJECTS— REPORTED EXPENDITURES, 1982-84+[1] BY STATES (000 dollars)

STATE	**PRODUCTION**	**ENVIRON-MENTAL**	**TOTAL**
Alabama	$1,046,540	$ 74,790	**$ 1,121,330**
Arizona	47,000	—	**47,000**
Arkansas	10,021	1,800	**11,821**
California	127,600	—	**127,600**
Connecticut	31,623	—	**31,623**
Florida	183,600	7,617	**191,217**
Georgia	617,175	39,900	**657,075**
Idaho	1,692	1,600	**3,292**
Illinois	6,000	—	**6,000**
Indiana	3,155	—	**3,155**
Louisiana	58,000	10,000	**68,000**
Maine	429,846	42,680	**472,526**
Massachusetts	5,575	—	**5,575**
Michigan	756,155	126,135	**882,290**
Minnesota	316,738	44,123	**360,861**
Mississippi	785,000	135,000	**920,000**
New Hampshire	87,000	5,000	**92,000**
New York	6,986	350	**7,336**
North Carolina	364,440	29,380	**393,820**
Ohio	72,374	1,270	**73,644**
Oklahoma	115,000	7,000	**122,000**
Oregon	49,198	21,912	**71,110**
Pennsylvania	58,023	40,630	**98,653**
South Carolina	1,215,670	132,000	**1,347,670**
Tennessee	75,646	13,500	**89,146**
Texas	136,486	7,550	**144,036**
Virginia	71,700	9,258	**80,958**
Washington	436,700	65,300	**502,000**
West Virginia	518	3,470	**3,988**
Wisconsin	267,984	20,145	**288,129**
Total	**$7,383,445**	**$840,410**	**$ 8,223,855[2]**

1. Includes projects, as announced, for completion in 1985 and later.
2. Dollar figure includes estimated $1,292,000,000 for projects to be completed in 1985 and later. ($1,288,000,000 production; $4,000,000 environmental).

MAJOR MODERNIZATION/ EXPANSION PROJECTS IN U.S.

(over $45,000,000 at an existing mill site)

Alton Packaging, Jacksonville, Fla.	$ 54,000,000
Augusta Newsprint/Abitibi, Augusta, Ga.	242,205,000*
Bowater Carolina, Catawba, S.C.	70,700,000
Bowater Southern, Calhoun, Tenn.	78,000,000
Champion International, Courtland, Ala.	172,070,000*†
Champion International, Canton, N.C.	80,940,000 †
Chesapeake, West Point, Va.	59,900,000 †
Container Corp., Fernandina Beach, Fla	75,000,000
Continental Forest Industries, Hodge, La.	66,000,000
Crown Zellerbach, Camas, Wash.	400,000,000*†
Federal Paper Board, Riegelwood, N.C.	215,000,000
Hammermill, Selma, Ala.	127,000,000
ITT Rayonier, Jesup, Ga.	120,000,000
International Paper, Bastrop, La.	64,000,000
International Paper, Georgetown, S.C.	500,000,000
James River, Berlin, N.H.	50,000
Kimberly-Clark, Coosa Pines, Ala.	74,500,000
Longview Fibre, Longview, Wash.	78,000,000
MacMillan Bloedel, Pine Hill, Ala.	294,170,000*
Mead, Escanaba, Mich.	300,000,000*
Pentair/Niagara, Niagara, Wis.	46,391,000 †
Pentair/Flambeau, Park Falls, Wis.	51,365,000 †
Philip Morris/Wisconsin, Menasha, Wis.	72,613,000*
Potlatch/Northwest, Cloquet, Minn.	46,000,000
St. Joe Paper, Port St. Joe, Fla.	54,600,000 †
St. Regis Paper, Bucksport, Maine	89,246,000
St. Regis Paper, Sartell, Minn.	309,000,000*
St. Regis Paper, Lufkin, Texas	97,678,000 †
Scott Paper, Mobile, Ala.	80,000,000
Scott Paper, Skowhegan, Maine	195,000,000*
Scott Paper, Westbrook, Maine	65,000,000
Scott Paper, Winslow, Maine	63,500,000
Southwest Forest Industries, Snowflake, Ariz.	47,000,000
Union Camp, Savannah, Ga.	163,000,000
Westvaco, Charleston, S.C.	100,000,000
Weyerhaeuser, Plymouth, N.C.	80,000,000*
Weyerhaeuser Valliant, Okla.	107,000,000*

*Includes new machine (also in listing of New Machines).
†Includes projects for completion in 1985 and later.

Data in this table necessarily omit expansion programs for which cost information has not been released.

North Carolina ($394 million).

The Midwest (two Census regions) accounts for $1.6 billion (20%) of the spending reported in the 1983 survey. Michigan is the Midwest's leader ($882 million), followed by Minnesota ($361 million) and Wisconsin ($288 million).

Spending programs in the West (Mountain/Pacific region) total $751 million, 9% of U.S. total. The West's share has been dropping in recent years, reflecting the long-run shift of new capacity additions to the South. Washington ($502 million) continues to be the leading state in the West.

New England (two Census regions) reports spending plans at $707 million, 8% of U.S. total. Maine ($473 million) remains the leader in this region.

The big spenders. Six companies report spending plans of over $500 million in the 1983 survey (three of these include projects to be completed in 1985 or later). Leader in reported spending is Champion International, with $797 million ($500 million is for the Quinnesec, Mich., mill which is now targeted for 1986 completion; and $172 million for the new paper machine project at Courtland, Ala.).

Union Camp is in No. 2 position, with $745 million ($550 million for the greenfield mill at Eastover, S.C.; and $163 million for major power and woodyard programs at Savannah, Ga.). Weyerhaeuser drops to No. 3 spot, due to postponement of originally-planned additional capacity at the new Columbus, Miss., mill. The $603 million reported for Weyerhaeuser includes $380 million for completion of the first phase at Columbus; and $107 million for a new machine at Valliant, Okla.

International Paper reports spending plans of $600 million, of which $500 million is for conversion of the Georgetown, S.C., mill to white paper and market pulp. Great Northern Nekoosa will spend $582 million, almost all of this ($540 million) for the greenfield Leaf River pulp mill under construction at New Augusta, Miss., to be operated as a division of GNN. St. Regis also reports an over-$500-million program ($557 million), including the new machine project at Sartell, Minn. ($309 million) and two major boiler installations ($180 million) at Bucksport, Maine, and Lufkin, Texas.

New mills and machines. Two new mills started up in the U.S. in 1982. At Columbus, Miss., Weyerhaeuser brought on-line a 175,000-tpy coated groundwood mill. (Ultimately the facility is to include a kraft pulp mill, an uncoated free-sheet machine and a second coated groundwood unit.) The second new mill to start up in 1982 was the 2500-tpy security papers mill of Portals Inc. at Hawkinsville, Ga.

Three mills are under construction. Union Camp is heading for 1984 startup for its 210,000-tpy bleached pulp/white paper mill at Eastover, S.C. Also targeted for 1984 startup is the GNN/Leaf River 350,000-tpy kraft pulp mill at New Augusta, Miss. Champion International's 265,000-tpy hardwood kraft pulp mill at Quinnesec, Mich., is moving toward a 1986 start. Independent Kraft

UNITED STATES—REPORTED CAPITAL EXPENDITURES FOR 1982-84+[1] BY REGIONS AND BY TYPE OF FACILITY ($000 dollars)

PRODUCTION:	**WOOD/FIBER**		**PULPING**		**NEW MACHINES**		**MACHINE MOD.**		**ENERGY**		**MISC./PLANT**	
New England	$ 10,000	2%	$ 86,145	5%	$ 65,000	10%	$ 83,449	16%	$ 215,300	9%	$ 84,150	5%
Mid-Atlantic	—	—	23,850	1%	—	—	7,150	1%	27,700	1%	6,309	1%
East North Central	56,488	12%	257,179	16%	108,000	16%	136,968	26%	221,976	10%	325,057	18%
West North Central	20,000	4%	62,000	4%	50,000	8%	34,000	7%	40,000	2%	110,738	6%
South Atlantic	107,960	24%	486,680	30%	107,000	16%	118,698	23%	1,139,955	50%	492,810	27%
East South Central	239,800	53%	534,800	32%	222,000	32%	21,116	4%	371,500	16%	517,970	29%
West South Central	8,922	2%	52,230	3%	65,000	10%	38,918	8%	111,666	5%	42,771	2%
Mountain/Pacific	11,610	3%	145,430	9%	50,000	8%	78,901	15%	160,998	7%	215,251	12%
Total	**$ 454,780**		**$1,648,314**		**$ 667,000**		**$ 519,200**		**$2,289,095**		**$1,795,056**	

							TOTALS:					
ENVIRONMENT:	**WATER**		**AIR**		**WASTE/UNSPEC.**		**PRODUCTION**		**ENVIRONMENT**		**GRAND TOTAL**	
New England	$ 15,000	4%	$ 32,680	7%	$ —	—	$ 544,044	7%	$ 47,680	6%	$ 601,724	7%
Mid-Atlantic	15,380	4%	25,600	6%	—	—	65,009	1%	40,980	5%	105,989	1%
East North Central	68,960	19%	69,290	15%	9,300	61%	1,105,668	15%	147,550	18%	1,253,218	15%
West North Central	21,480	6%	20,860	5%	1,783	12%	316,738	4%	44,123	5%	360,861	5%
South Atlantic	91,333	25%	129,272	28%	1,020	7%	2,453,103	34%	221,625	26%	2,674,728	33%
East South Central	102,490	28%	120,800	26%	—	—	1,907,186	26%	223,290	27%	2,130,476	26%
West South Central	13,000	4%	10,250	2%	3,100	20%	319,507	4%	26,350	2%	345,857	4%
Mountain/Pacific	37,615	10%	51,197	11%	—	—	662,190	9%	88,812	11%	751,002	9%
Total	**$ 365,258**		**$ 459,949**		**$15,203**		**$7,383,445**		**$ 840,410**		**$8,223,855[2]**	

1. Includes projects, as announced, for completion in 1985 and later.
2. Dollar total includes estimated $1,292,000,000 for projects to be completed in 1985 and later ($1,228,000,000 production; $4,000,000 environmental).

Regions are as follows:
New England: Me., Vt., N.H., Conn., R.I., Mass.
Mid-Atlantic: N.Y., N.J., Pa.
East North Central: Wis., Mich., Ill., Ind., Ohio
West North Central: N.D., S.D., Neb., Kans., Minn., Iowa, Mo.
South Atlantic: Del., Md., W. Va., Va., N.C., S.C., Ga., Fla.
East South Central: Ky., Tenn., Miss., Ala.
West South Central: Okla., Tex., Ark., La.
Mountain/Pacific: Wash., Ore., Calif., Alaska, Ida., Nev., Mont., Wyo., Utah, Ariz., Colo., N.M.

Corp. is not yet under construction but is reportedly aiming for 1984 start of a 280,000-tpy linerboard mill at Tuscaloosa, Ala.

Eleven other greenfield mills are under consideration but have not been assigned a target date (see "New Greenfield Mills" list).

Sixteen new machines are listed. Six of these started in 1982 and ten are scheduled for startup at U.S. mills in the next couple of years. Four are for coated or uncoated free-sheet, three are for groundwood papers, two for linerboard, one for corrugating medium, one for newsprint, one for tissue; four small units are for fiberglass roofing mat. An additional nine machines have been proposed but have received no final approval.

Spending by categories. The only category in the 1983 survey in which reported spending programs significantly exceed those reported in the 1982 survey is "Energy/power." Some $2.3 billion is targeted to be spent in this area of the mill, 28% of U.S. total pulp/paper industry spending. The increase in this category obviously reflects the increased attention being given to energy matters by the industry; it is also to some degree

NEW 'GREENFIELD' MILLS IN U.S.

WITH SCHEDULED STARTUP DATE

Augusta Kraft Co., Augusta, Ga. **1984**
Proposed 262,500-tpy kraft linerboard mill

Champion International, Quinnesec, Mich. **1986**
265,000-tpy bleached hardwood kraft pulp mill

GNN/Leaf River Forest Products, New Augusta, Miss. **1984**
350,000-tpy bleached softwood/hardwood kraft pulp mill

Independent Kraft Corp., Tuscaloosa, Ala. **1984**
280,000-tpy kraft linerboard mill*

Kimberly-Clark Corp.,La Grange, Ga. **1985**
Proposed plant to produce nonwoven fabrics

Portals Inc., Hawkinsville, Ga. **1982**
New 2500-tpy security papers mill

Union Camp Corp., Eastover, S.C. **1984**
210,000-tpy bleached pulp/white paper mill*

Weyerhaeuser Co., Columbus, Miss. **1982**
175,000-tpy coated groundwood paper mill*

PROPOSED

Boise Cascade Corp., South Carolina **No date**
Possible 800-tpd bleached kraft pulp mill under study; with possible addition of one or two paper machines later

Carolina Forest Industries, Bennetsville, S.C. **No date**
Proposed newsprint mill, by Stora Kopparberg/Canal Indus.

Champion International, Halifax, N.C. **No date**
Proposed bleached pulp/paper complex; site purchased

Champion International, Jasper, Texas **No date**
Proposed 1000-tpd unbleached pulp/linerboard mill

Georgia Kraft Co., Elberton, Ga. **No date**
Proposed 1300-tpy linerboard mill; site is purchased

Grenada Paper Co., Grenada, Miss. **No date**
Proposed 215,000-tpy news mill (formerly No. Mississippi)

Inland Container Corp., Ontario, Calif. **No date**
Possible recycled linerboard mill

Kimberly-Clark Corp., Southeast U.S. **No date**
Possible pulp mill to supply fiber for disposable diapers

Sunbelt Forest Products Corp., Boligee, La. **No date**
Proposed 210,000-tpy newsprint mill

Tenma Paper Mills & Co., Brunswick, Ga. **No date**
Proposed 70-80,000-tpy clay-coated SBS foodboard mill

Wilbert Associates, Globe, Ariz. **No date**
Possible 175,000-tpy newsprint mill

*Machine included in "New Machines" listing

NEW PAPER MACHINES IN U.S.

WITH SCHEDULED STARTUP DATE

Augusta Newsprint Co./Abitibi, Augusta, Ga. **1983**
226,000-tpy, 336-in.-trim Valmet—newsprint

Bird & Son, Charleston, S.C. **1983**
18,000-tpy, 120-in.-trim Sandy Hill—fiberglass roofing mat

Champion International, Courtland, Ala. **1983**
145,000-tpy, 288-in.-wire Beloit—uncoated free-sheet

Crown Zellerbach, Camas, Wash. **1985**
160,000-tpy, 276-in.-trim Beloit—uncoated free sheet

Genstar Stone Products Co., Ennis, Texas **1983**
25,000-tpy, 165-in.-wide Sandy-Hill—fiberglass roofing mat

Independent Kraft Corp., Tuscaloosa, Ala. **1984**
280,000-tpy, 256-in.-trim machine—linerboard

MacMillan Bloedel Inc., Pine Hill, Ala. **1982**
210,000-tpy, 284-in.-wire Tampella—corrugating medium

Mead Corp., Escanaba, Mich. **1982**
200,000-tpy, 305-in.-trim, Valmet—coated. groundwood

Owens-Corning Fiberglas, Aiken, S.C. **1982**
New Sandy Hill unit—fiberglass roofing mat

Philip Morris/Wisconsin, Menasha, Wis. **1982**
65,000-tpy, 208-in.-trim Beloit—tissue

St. Regis Paper Co., Sartell, Minn. **1982**
170,400-tpy, 314-in.-trim Beloit—coated groundwood

Scott Paper Co., Skowhegan, Maine **1983**
200,000-tpy, 290-in.-trim Beloit—coated free-sheet

Tamko Asphalt Products Inc., Joplin, Mo. **1983**
New Sandy Hill unit—fiberglass roofing mat

Union Camp Corp., Eastover, S.C. **1984**
210,000-tpy, 372-in.-wire Voith—uncoated free-sheet

Weyerhaeuser Co., Columbus, Miss. **1982**
175,000-tpy, 289-in.-trim Beloit—coated groundwood

Weyerhaeuser Co., Valliant, Okla. **1982**
194,000-tpy, 268-in.-trim, KMW-Johnson—linerboard

PROPOSED

Blandin Paper Co., Grand Rapids, Minn. **No date**
Proposed 175,000-tpy unit—lightweight coated groundwood

Boise Cascade Corp., International Falls, Minn. **No date**
Possible new machine—uncoated groundwood

Fort Howard Paper Co., Muskogee, Okla. **No date**
Planning for fourth machine underway—tissue

Georgia-Pacific, Crossett, Ark., or Palatka, Fla. **No date**
Possible 300,000-tpy, 349-in. trim unit—kraft paper/board

Georgia-Pacific, Port Hudson, La. **No date**
Possible 138,000-tpy unit—uncoated free-sheet

Longview Fibre Co., Longview, Wash. **No date**
Proposed No. 12 paper machine—lightweight kraft

Southeast Paper Mfg. Co., Dublin, Ga. **No date**
Possible second 158,000-tpy machine—recycled newsprint

Westvaco Corp., Wickliffe, Ky., or Luke, Md. **No date**
150,000-tpy machine—coated free-sheet

Weyerhaeuser Co., Columbus, Miss. **No date**
Add two machines—unctd free-sheet; coated groundwood

attributable to more accurate reporting by mills and more accurate assignment of costs by P&P.

Programs identified as "Plant/miscellaneous" account for $1.8 billion, 22% of U.S. total. This is considerably lower than the "miscellaneous" total reported a year ago and is greatly due to the more accurate allocation of costs to the "energy" category in this current survey.

Expansions and modifications at pulp mills, including bleach plant and recovery boilers, account for $1.6 billion, 20% of U.S. total. Programs for woodyard improvement, chip handling, etc., were segregated into a separate category, "Fiber/woodyard," for the first time in this 1983 survey. The total for this new category is $455 million, 6% of U.S. Together these two areas of the mill represent 26% of the 1983 U.S. total spending (in 1982, the combined "Pulping/fiber" category was 28% of the U.S. industry's total).

Spending for "New machines" in the 1983 survey totals $667 million, 8% of U.S. This is a substantial reduction from the year-ago figure (which included 11 machines that came on-line in 1981). Some $519 million is allocated to modifications of paper machine, 6% of total.

Environmental spending plans reported in the 1983 survey total $593 million. Water-quality programs account for $316 million (53% of environmental spending) and air-quality programs for $275 million (46%). Solid waste programs were reported at $2 million (less than 1% of environmental total).

Spending by region. The South, of course, continues to lead all other areas in pulp/paper spending programs, with $5.2 billion reported in the 1983 survey, 63% of total U.S. spending. (Current capacity in the South is approximately 59% of U.S. combined pulp and paper total.) Expansion/modernization plans in the Midwest total $1.6 billion, 20% of U.S. (Midwest pulp/paper capacity is roughly 13% of U.S.) Spending programs in the West, at $751 million, are 9% of U.S. total. (Western capacity is about 15% of U.S.) The Northeast planned programs will cost $708 million, 8% of U.S. total. (Northeast capacity is 13% of U.S.)

SUMMARY OF CANADIAN PROJECTS— REPORTED EXPENDITURES 1982-84+[1] BY PROVINCES ($000 Canadian dollars)

PROVINCE	PRODUCTION	ENVIRONMENTAL	TOTAL
Alberta	$ 183,440	$ 30,000	**$ 213,440**
British Columbia	859,337	136,151	**995,488**
Manitoba	3,495	—	**3,495**
New Brunswick	499,149	44,083	**543,232**
Newfoundland	74,850	—	**74,850**
Nova Scotia	133,335	6,300	**139,635**
Ontario	1,804,326	142,641	**1,946,967**
Quebec	1,070,612	234,554	**1,305,166**
Saskatchewan	31,520	—	**31,520**
Total	**$4,660,064**	**$593,729**	**$5,253,793[2]**

1. Includes projects, as announced, for completion in 1985 and later.
2. Dollar total includes estimated C$697,000,000 for projects to be completed in 1985 and later ($670,000,000 production; $27,000,000 environmental).

CANADA

Government aid in eastern provinces permits increased spending plans

Spending programs by Canadian pulp/paper mills reported in the 1983 survey total C$5.3 billion, a modest 6% below the 1982 figure. Government support for expansions in Ontario and Quebec is behind the higher levels reported by the two big provinces, which counterbalance lowered targets elsewhere in Canada. The $5.3 billion figure includes $697 million for projects to be completed in 1985 and later; it does not include programs which have been indefinitely postponed or for which no startup date has been set.

The province of Ontario reports plans to spend $1.9 billion, 37% of the country's total (a rise from 28% in last year's survey). Most of this is for production-related programs—$1.8 billion, or 93%; environmental programs will get 7%, or $143 million.

Quebec mills are reporting $1.3 billion in spending plans, 25% of Canadian total (up from 21% in 1982). Production projects will get $1.1 billion (82%) and environmental programs will cost $235 million (18%).

The West (provinces of British Columbia and Alberta) has spending plans for $1.2 billion, 23% of the nation's total (a large drop from 34% reported last year). Of the $1.2 billion, $1 billion (86%) is targeted for production projects and $166 million (14%) for environmental programs. The B.C. industry has been hit hard by reduced export markets and continuing higher costs.

Spending plans for the Maritimes (New Brunswick, Newfoundland, Nova Scotia) are reported at $758 million, 14% of the total (down slightly from 16% a year ago). Canada's "Central" region (Manitoba and Saskatchewan) has few pulp/paper mills and modest plans to spend $35 million, 1% of the country's total (unchanged from last year).

Company spending plans. Seven companies report spending programs of more than C$300 million (one more than in the 1982 survey) and 20 companies report spending plans for at least $100 million (same number as last year).

Consolidated-Bathurst plans to spend $372 million, with major programs at Bathurst, N.B., Ville de La Baie, Trois Rivières (new groundwood specialty machine) and Shawinigan, Que. Great Lakes Forest Products will spend $356 million, with $340 million on a renovation at Dryden, Ont. (with new uncoated free-sheet machine).

B.C. Forest Products plans $350 million, for a newsprint machine at Crofton, B.C., and greenfield newsprint mill at Hurdy, Alta. (due for 1985 or later start).

Ontario Paper is spending $346 million at Thorold, Ont., primarily for two new newsprint machines now online at the mill. (About $10 million of Ontario's spending is for projects now postponed to 1985 or later.) Abitibi's budget is for $345 million, designed primarily for a new newsprint machine at Iroquois Falls, Ont., and major programs at Grand Falls, Nfld., and Beaupré, Que.

Rexfor/Soucy is, with substantial government participation, embarking on a $325 million, greenfield 160,000-metric-tpy newsprint mill at Matane, Que. Northwood Pulp & Timber has completed a $320-million expansion at its kraft market pulp mill at Prince George, B.C.

New mills and machines. One new mill (Donohue Normick at Amos, Que.) started up in 1982. Two mills (BCFP at Hurdy, Alta., and Rexfor/Soucy at Matane, Que.) are scheduled for construction but may not meet targeted startup dates.

Five new newsprint machines came on-line at Canadian mills in 1982: BCFP at Crofton, B.C.; Crown Zellerbach at Campbell River, B.C.; the new Donohue Normick unit at Amos, Que.; and two machines for Ontario Paper at Thorold, Ont. Con-Bath started a new groundwood specialty machine at Trois Rivières, Que.

Spending by categories. Pulp is of great importance to the Canadian industry and receives a larger share of attention (and funding) than in the U.S.

TOP SPENDERS IN U.S.

Companies for which P&P reports capital spending plans of $100,000,000 or more, including production and environmental programs

	1982-84	1981-83
Champion International	$796,780,000*	$ 800,974,000*
Union Camp Corp.	744,800,000	803,900,000*
Weyerhaeuser	603,460,000	1,243,100,000*
International Paper	600,000,000	878,000,000
Great Northern Nekoosa	582,120,000†	176,349,000*
St. Regis Paper	556,862,000	820,638,000
Scott Paper	431,000,000*	395,500,000
Crown Zellerbach	420,000,000*	530,900,000*
Mead Corp.	331,200,000	440,200,000
MacMillan Bloedel Inc.	308,120,000	318,355,000
Independent Kraft	244,000,000	—
Augusta Newsprint/Abitibi	242,205,000	243,495,000
Federal Paper Board	237,496,000	175,130,000
Hammermill Paper	178,648,000*	274,346,000
Bowater North America	149,670,000	63,500,000
Pentair Inc.	115,271,000*	103,800,000
Continental Forest Ind.	115,000,000	262,000,000
Westvaco	100,000,000	140,000,000

*Includes programs for completion beyond 3-year period indicated.
†Includes Leaf River project, reported separately last year.

Total cost of a multi-year project is assigned to the year of startup.

NEW 'GREENFIELD' MILLS IN CANADA

(metric tons)

WITH SCHEDULED STARTUP DATE

B.C. Forest Products Ltd., Hurdy, Alta. **Delay to 1987**
175,000-tpy TMP/newsprint mill*

Donohue Normick Inc., Amos, Que. **1982**
159,000-tpy TMP/newsprint mill*

Rexfor/Soucy, Matane, Que. **1984/85**
160,000-tpy TMP/newsprint mill

PROPOSED

Alberta Energy Corp., Whitecourt, Alta. **No date**
Plans to build 600-tpd pulp mill indefinitely postponed

B.C. Cellulose Ltd., Ocean Falls, B.C. **No date**
Possible cedar kraft pulp mill

Doman Industries Ltd., Nanaimo, B.C. **No date**
Proposed 175,000-tpy TMP mill, possibly newsprint later

Makin Project Ltd., Red Deer, Alta. **No date**
Proposed 85,000-tpy CMP/43,000-tpy printing/writing paper mill, with additional CMP/second paper machine later*

Northwood/Atco, Rocky Mtn. House, Alta. **No date**
Proposed 15-year program for 150,000-tpy kraft pulp mill, TMP mill, 175,000-tpy paper machine; later add CMP mill, second and third paper machines

Quebec Public Works Ministry, Maniwaki, Que. **No date**
Possible 400-tpd medium-density fiberboard mill

Saskatchewan Crown Investment Corp., Sask. **No date**
Very tentative proposal for 175,000-tpy newsprint mill

*Machine included in "New Machines" listing

CANADA—REPORTED CAPITAL EXPENDITURES FOR 1982-84+[1] BY REGIONS AND BY TYPE OF FACILITY (000 Canadian dollars)

PRODUCTION:	WOOD/FIBER		PULPING		NEW MACHINES		MACHINE MOD.		ENERGY		MISC./PLANT	
Maritimes	$ 15,170	8%	$ 402,331	22%	$ —	—	$ 29,480	10%	$ 179,538	30%	$ 80,815	7%
Quebec	52,575	28%	374,997	20%	161,300	26%	169,974	57%	124,977	20%	186,789	17%
Ontario	77,390	42%	724,219	40%	250,000	41%	66,510	22%	131,308	22%	554,899	49%
Central	3,950	2%	15,270	1%	—	—	—	—	7,395	1%	8,400	1%
West	36,050	20%	316,469	17%	200,000	33%	33,400	11%	165,558	27%	291,300	26%
Total	**$ 185,135**		**$1,833,286**		**$ 611,300**		**$ 299,364**		**$ 608,776**		**$1,122,203**	

							TOTALS:					
ENVIRONMENT:	WATER		AIR		WASTE/UNSPEC.		PRODUCTION		ENVIRONMENT		GRAND TOTAL	
Maritimes	$ 7,000	2%	$ 43,383	16%	$ —	—	$ 707,334	15%	$ 50,383	8%	$ 757,717	14%
Quebec	116,084	37%	116,358	42%	2,112	91%	1,070,612	23%	234,554	40%	1,305,166	25%
Ontario	95,321	30%	47,320	17%	—	—	1,804,326	39%	142,641	24%	1,946,967	37%
Central	—	—	—	—	—	—	35,015	1%	—	—	35,015	1%
West	97,782	31%	68,169	25%	200	9%	1,042,777	22%	166,151	28%	1,208,928	23%
Total	**$ 316,187**		**$ 275,230**		**$ 2,312**		**$4,660,064**		**$ 593,729**		**$5,253,793[2]**	

1. Includes projects, as announced, for completion in 1985 and later.
2. Dollar total includes estimated C$697,000,000 for projects to be completed in 1985 and later ($670,000,000 production; $27,000,000 environmental).

Note: Tabulations are based on these regional divisions: "Maritimes" is New Brunswick, Newfoundland, and Nova Scotia; "Central" is Manitoba and Saskatchewan; "West" is British Columbia and Alberta; Ontario and Quebec are treated individually.

Planned expenditures for the pulping area reported in the 1983 survey are C1.8 billion, and for the supporting woodyard/fiber area $185 million. Together these two categories account for $2 billion, or 38% of Canada's proposed spending.

Expenditures in the "Plant/miscellaneous" category are reported at $1.1 billion, 21% of the national total. New machines will cost $611 million, or 12% of the total, while modifications of paper machine are budgeted at $299 million, 6% of total. Expenditures for energy and power are planned to be $609 million, 12% of the total.

Environmental programs at Canadian mills account for $594 million of the proposed spending, 11% of total. Water-quality programs will cost $316 million (6% of total), air-quality projects are priced at $275 million (5% of total), with $2 million for "solid waste/unspecified."☐

NEW PAPER MACHINES IN CANADA

(metric tons)

WITH SCHEDULED STARTUP DATE

Abitibi-Price Inc., Iroquois Falls, Ont. No. 8 190,000-tpy, 352-in.-trim, Valmet—newsprint	**1983**
B.C. Forest Products, Hurdy, Alta. 175,000-tpy machine—newsprint	**1987**
B.C. Forest Products, Crofton, B.C. 175,000-tpy, 300-in.-trim Beloit—newsprint	**1982**
Consolidated-Bathurst, Trois Rivières, Que. 68,000-tpy, 194-in.-trim BC-Kennedy—unctd groundwood	**1982**
Crown Zellerbach Canada, Campbell River, B.C. 175,000-tpy, 360-in.-trim, Valmet—newsprint	**1982**
Donohue-Normick Inc., Amos, Que. 159,000-tpy, 300-in.-trim, Dominion—newsprint	**1982**
Great Lakes Forest Products Ltd., Dryden, Ont. 122,000-tpy, 194-in.trim Valmet—uncoated free-sheet	**1983**
Ontario Paper, Thorold, Ont. Two 310,000-tpy (total), 300-in.-trim Beloit—news/gwd	**1982**
Rexfor/Soucy, Matane, Que. 160,000-tpy, 300-in.-trim machine—newsprint	**1984**
Scott Paper Ltd., New Westminster, B.C. 36,000-tpy, 185-in.-trim KMW—tissue	**1984**

PROPOSED

Abitibi-Price Inc., Grand Falls, Nfld. No.4 machine (postponed from 1984)—newsprint	**No date**
Abitibi-Price Inc., Iroquois Falls, Ont. New unit (postponed from 1985-86)—newsprint	**No date**
Abitibi-Price Inc., Alma, Que. Proposed new unit—newsprint	**No date**
Consolidated-Bathurst, Bathurst, N.B. Possible replacement of existing unit—corrugating medium	**No date**
Great Lakes Forest Products Ltd., Dryden, Ont. Possible 175,000-tpy machine—newsprint	**No date**
Kruger Inc., Trois Rivières, Que. 172,000-tpy, 300-in. Beloit—newsprint	**No date**
James Maclaren Co., Masson, Que. Proposed 194,000-tpy unit—newsprint	**No date**
MacMillan Bloedel Ltd., New Westminster, B.C. Proposed 75,000-tpy, 159-in.-trim Valmet—unctd free-sheet	**No date**
Makin Project Ltd., Red Deer, Alta. 43,250-tpy, 142-in.Bellmer—several paper grades	**No date**

MAJOR MODERNIZATION/ EXPANSION PROJECTS IN CANADA

(over C$35,000,000 at an existing mill site)

Abitibi-Price, Grand Falls, Nfld.	C$ 49,400,000*
Abitibi-Price, Iroquois Falls, Ont.	132,100,000
Abitibi-Price, Beaupre, Que.	87,200,000
BC Timber, Prince Rupert, B.C.	47,045,000
Boise Cascade Canada, Fort Frances, Ont.	35,000,000 †
Boise Cascade Canada, Kenora, Ont.	150,000,000
Bowater Inc., Liverpool, N.S.	71,000,000
B.C. Forest Products, Crofton, B.C.	150,000,000*
CIP Inc., Dalhousie, N.B.	146,600,000
CanFor/Prince Geo P&P, Prince Geo, B.C.	73,508,000
Consolidated-Bathurst, Bathurst, N.B.	98,000,000
Consolidated-Bathurst, Shawinigan, Que.	43,290,000
Consolidated-Bathurst, Trois Rivières, Que.	75,273,000*
Consolidated-Bathurst, Ville de La Baie, Que.	99,234,000
Crown Canada, Campbell River, B.C.	174,300,000
Domtar, Red Rock, Ont.	62,000,000
Domtar, Donnacona, Que.	45,825,000
Donohue, Clermont, Que.	42,550,000
E.B. Eddy Forest Products, Espanola, Ont.	271,919,000 †
Fraser Inc., Atholville, N.B.	170,000,000
Fraser, Edmundston, N.B.	53,000,000
Great Lakes Forest Products, Dryden, Ont.	345,800,000*
K-C/Spruce Falls, Kapuskasing, Ont.	88,200,000
James Maclaren Co., Thurso, Que.	70,000,000
Northwood Pulp, Prince George, B.C.	320,000,000
Nova Scotia Forest Ind., Point Tupper, N.S.	52,910,000
Ontario Paper, Thorold, Ont.	263,313,000*†
Reed Inc., Quebec City, Que.	120,000,000 †
Scott Maritimes, Abercrombie Point, N.S.	61,125,000 †
Scott Paper Ltd., New Westminster, B.C.	63,000,000*

*Includes new machine (also in listing of New Machines).
†Includes projects for completion in 1985 and later.

Data in this table necessarily omit expansion projects for which cost information has not been released.

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Worldwide naval stores industry

International Naval Stores meeting focuses on gum, tall oil rosin production/demand in the U.S., Europe, South America, and China

By KENNETH E. SMITH, Executive Editor

☐ The U.S. economy will continue to recover, but growth will be sluggish in 1983, according to **Fred L. Buckner**, business group director of resins for Hercules Inc. Addressing about 200 delegates representing 18 countries at the Ninth International Naval Stores meeting in Washington, D.C., Buckner predicted that real gross national product (GNP) will increase by only about 3% this year after an overall decline of 1.4% in 1982. Citing the restrictive monetary policies of the Federal Reserve, high private-sector loan demand, and the outlook for a federal budget deficit of up to $150 billion for fiscal year 1983, Buckner said that interest rates are unlikely to ease enough to allow a stronger recovery (4% to 5% GNP growth) more typical of recent post-recession years. Other speakers at the conference reported on the naval stores industries in the U.S., Europe, Latin America, and Japan, with particular emphasis on rosin, and echoed a somewhat pessimistic outlook for the industry worldwide.

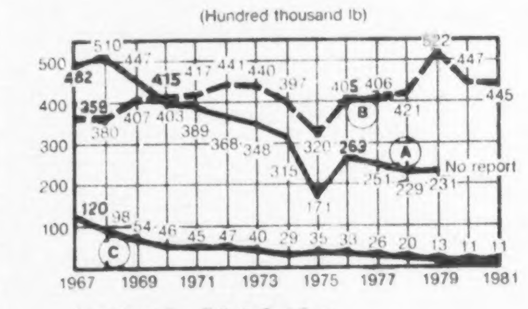
On a more positive note, Buckner noted that major pluses for the economy are a sharp increase in real disposable income and completion of inventory liquidations by most businesses. The recent tax cut and increases in Social Security payments are the main factors behind the increase in real disposable income. Combined with a higher saving rate, revealed in the government's latest revision of national income data, and paydown of installment debt, consumers are in a good position to increase spending.

In other areas important to the naval stores industry, the economic picture is similar. The outlook for Europe's economy is for an increase in real GNP of only about 2% this year. European inventories are believed to be relatively low and will require some rebuilding with any improvement in demand. With their currencies weak relative to the U.S. dollar, Europe's competitive position has improved in world markets, and recovery in the U.S. would be an added source of strength. Government policies, though generally committed to combatting inflation, are likely to become less restrictive in the face of rising unemployment and political pressures.

Latin America experienced no growth in real GNP during 1982 for the second consecutive year, and inflation rates were substantially higher than 1981. Slight economic growth (1%) is expected in 1983, but inflation is not expected to abate. Latin America is plagued by high and increasing debt levels for which the servicing costs are exacerbated by currency devaluation and by the high cost of new borrowings. The debt problems will lead to significantly slower growth in the region over the next several years.

In Japan, the slowdown in exports, stemming from the

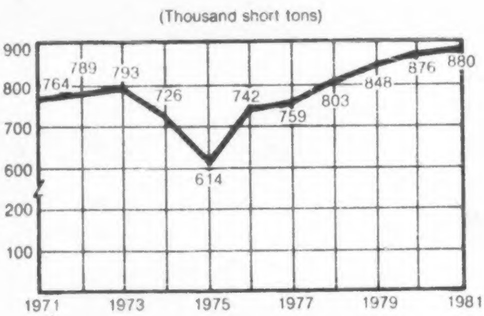
FIGURE 1: **U.S. rosin production**



A = Wood; B = Tall oil; C = Gum

Source: Pulp Chemicals Assn.

FIGURE 2: **Crude tall oil production**



Source: Pulp Chemicals Assn.

slowed by recession in 1982

continuing worldwide recession and the country's voluntary restraint in an attempt to avoid protectionist measures, has resulted in a generally sluggish economy. Real GNP grew only 3.5% in 1982. Assuming an acceleration of economic activity in other world ecomomies, Japan's growth should increase to about 4% for 1983.

U.S. naval stores

MORRIS

Charles W. Morris, vice president and general manager of Sylvachem Corp., spoke on the U.S. production and consumption of tall oil naval stores products. According to Morris, tall oil rosin accounted for more than two-thirds of the rosin produced in 1982. Tall oil rosin is the product of crude tall oil fractionation, which also yields tall oil fatty acids (TOFA).

Crude tall oil production grew during the late 1960s and 1970s at an annual rate of 1.5%, which has been slowed by the current recession. Tall oil fractionation rate has also been slowed and was only 77% in 1982 of the rate in 1981. Morris blames both the recession and technological changes in key markets for this slowdown. The shift from solvent-based enamel paints to water-reducible and high-solids paints has substantially reduced demand for alkyds made from TOFA. Morris predicted that, without intensive new product development, high TOFA inventories would continue throughout the industry in the 1980s.

High inventories are also currently a problem with tall oil rosin. Since 1981, U.S. inventories have increased at a compounded rate of better than 8%. Sluggish activity in the paper industry has reduced demand for rosin size, one of the larger outlets for tall oil rosin. The strong dollar and the worldwide recession have slowed rosin exports. Crude tall oil inventory has also been growing. It reached 89,000 tons in 1982, which is the highest inventory since 1967.

Morris feels the current hard times for the rosin industry are only temporary. He pointed to technical improvements over the past 25 years which have upgraded tall oil rosin and eliminated most of its early, unpleasant characteristics. Also, lately hydrocarbon resins have begun to lose their price advantage over rosin resins due to rapid increases in the price of naphtha, which has risen 600% in the last eight years. Naphtha is a feedstock for ethylene, and petrochemical resins are a byproduct of the ethylene manufacturing process. The price adjustment, combined with improved qualities, may enable tall oil rosin to recapture many markets lost to hydrocarbons resins in the 1960s.

The recent increase in patents issued for tall oil rosin development seems to indicate resurgence of interest in rosin. The number of patents issued between 1972 and 1980 increased by nearly 400% over the number issued between 1961 and 1970. Morris concluded by saying that continued development will open many new markets for tall oil rosin in the next decade; that stability problems would be solved; that color, odor, and taste will continue to improve; and that tall oil rosin has reached a stage where it can be customized for many applications.

European naval stores

SCHULTZ

Dr. Wolf-Stefan Schultz, president of Collodin Chemie, reported on developments in Europe with particular emphasis on naval stores in Fed. Rep. of Germany, which is the largest user of rosin the Europe. According to Dr. Schultz, the major portion of tall oil rosin sold in Europe is from Scandinavia. Finland is the largest Scandinavian producer with an annual capacity of more than 40,000 tons. Sweden has the largest single distillation facility with a capacity of 30,000 tons annually. This plant is operated by Bergvik Kemi, a subsidiary of Stora Kopparberg. Norway has one plant at M. Peterson with a capacity of 12,000 tpy.

Union Camp Corp. owns a fractionation plant in the United Kingdom capable of distilling 24,000 tpy of rosin. This particular plant will distill American crude tall oil for sale to European customers. In addition to these tall oil rosin producers in Europe, Portugal produces about 100,000 tons annually of gum rosin.

Since 1977, tall oil rosin has captured an increasingly large share of the total German rosin imports (about 65,000 tpy average). Most of this rosin is from Scandinavia. About 89% of all German rosin imports are still gum rosin, primarily from China and Portugal.

Schultz also said that research conducted by his company has shown that with special modifications of the rosin, rosin sizing can be used effectively in papermaking at pHs as high as 8, along with large quantities of calcium carbonate as filler. He predicted that rosin size will continue as a universally applicable paper sizing agent, but that demand will be stagnant at a high level by 1990.

In the field of printing-rosins and lac-rosins, the situation is somewhat different. The market for phenol-modified colophonium products is on the decline due to cost pressures prevailing in the industry. The rapidly growing market for illustration printing requires mainly carbonic hydrogen resins, which average $0.09/lb cheaper than comparative rosin derivatives. A growing market does exist in the field of cheap printing inks for calcium and magnesium resinates, which some ink makers produce themselves.

The adhesive market in Germany will remain a growth market because many manufacturing bonding problems can be solved economically through the use of adhesives.

Schultz concluded by saying that American rosin will have only a limited future market in Germany unless American suppliers commit to the market for the long term rather than just selling surplus production there.

G. SMITH

South American naval stores

In his report, **Gerard C. Smith**, director and general manager, Hercules Do Brazil Productos Quimicos Ltd., said that the naval stores industry in South America is mainly concentrated in the southern portion of the continent in Brazil, Argentina, and Chile. Brazil's pine forests were mostly planted as a result of government incentives to industry started in 1966, and consist mainly of slash and loblolly pine.

Slash pine is the main source of gum rosin in Brazil with present yields typically between 4.0 and 6.6 lb of gum dip/tree/season, which starts in October and ends in May/June. The typical life cycle of Brazilian pine plantations is 20 to 25 years, and tapping for gum production can begin at 12 years. Assuming 4.4 lb of gum dip/tree and 300 trees/acre, the Brazilian pine forests have the potential to produce about 480,000 tons of dip/year, which is the equivalent of 330,000 tons of rosin and 58,000 tons of turpentine annually.

Actual gum rosin production in Brazil is expected to reach only about 17,000 tpy in the next three to five years, which is about one-half of expected domestic demand (33,000 tpy). This level of gum rosin production will concurrently yield about 2800 tons of turpentine. Of the total amount of rosin consumed in Brazil, about 35% is used in hard resins, 25% in paper size, 20% in disproportionated rosin emulsifiers, and 20% into miscellaneous uses.

Smith reported that Argentina also has a growing naval stores industry based on gum dip from pine plantations. About 5600 tons of rosin are produced annually, which is enough to make the country self-sufficient without significant surplus for export. Chile is gumming its pine plantations on a limited scale with an annual rosin production level of around 1300 tons.

Naval stores in the Far East

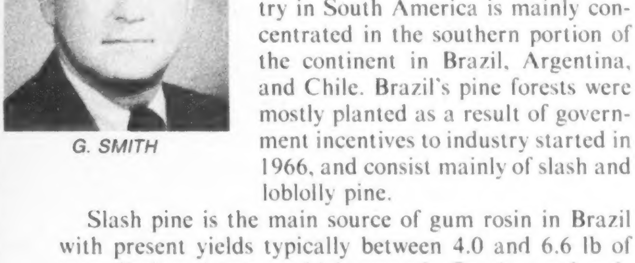
HAMASAKI

According to **Kokichi Hamasaki**, managing director of Nichimen Corp., Japan imports approximately 67,000 tpy of rosin, about 80% of which comes from China. In 1981, demand for rosin in Japan declined dramatically compared with 1980 because of depressed demand for paper and rubber products. Paper sizing demand declined to 33,000 tons, down about 12% from 1980. Also, petroleum resins have continued to make sizable inroads into rosin markets, and about 90,000 tpy of these resins are used for making paint, printing inks, adhesives, and sizing agents. Hamasaki stated that, in light of present conditions, further growth in demand for naval stores products in Japan cannot be expected.

Hamasaki reported that China now has a rosin production capacity of 670,000 tpy, with about 260 rosin plants, but only produced about 340,000 tons in 1980. China reportedly has large quantities of rosin in inventory, which it will be seeking to export this year. This activity is likely to drive world prices down further.

John Drew, president of Drew Forest Chemicals Laboratory, spoke on the history of the naval stores industry. ☐

FIGURE 3: **U.S inventory tall oil rosin**



Source: Puip Chemicals Assn.

TABLE 1: **Tall oil fatty acid inventory**

	(Thousand lb)	
	More than 2% rosin	**Less than 2% rosin**
1972	7,644	6,612
1973	9,919	4,922
1974	8,918	6,252
1975	19,228	7,750
1976	8,321	5,208
1977	9,493	8,280
1978	15,703	10,333
1979	16,315	9,678
1980	56,140	8,108
1981	33,171	14,809
1982		
Jan	28,143	13,938
Feb	22,570	15,128
Mar	20,049	10,160
Apr	22,448	14,896
May	25,771	13,640
Jun	18,721	18,570
Jul	16,100	11,800

Source: Pulp Chemicals Assn.

Chlorine production down, but prices firm

By BARRY SHOCKETT

The production of chlorine has been dropping steadily, and is down 16% for the first eight months of 1982 vs 1981. In August, 698,000 tons of chlorine were produced, a 20% drop. August operating rate decreased to 57.5% (according to the Chlorine Institute), compared with 71% last year and 65% in June 1982. The operating rate for 1982 overall dropped to an estimated 64%, compared with 74% and 80% in 1981 and 1980, respectively. The average selling price increased $20/ton to an estimated $120/ton in the fourth quarter.

Although chlorine demand by the Canadian pulp and paper industry is also down in 1982, production has increased this year primarily because Dow Chemical has been running both its plants full out to supply the customers of Dow Midland, which closed its chloralkali facility in June 1982. Chlorine exports increased to more than 200,000 tpy.

U.S. statistics, chlorine (000 short tons)

	1979	1980	1981	1982e
Capacity (est)	14,200	14,235	14,300	14,500
Production	12,290	11,421	10,558	9300
Imports	133	166	182.5	205
Exports	94	117	50.5	25
Apparent consumption	12,329	11,470	10,690	9480
Pulp and paper	1600	1500	1400	1200

Sources: Bureau of Census, U.S. Dept. of Commerce; PULP & PAPER and industry estimates.

Canadian statistics, chlorine (000 short tons)

	1979	1980	1981	1982e
Capacity	1374	1730	1741	1769
Production	1137	1435	1461	1488
Imports	31	42.5	27	15
Exports	133	166	182.5	205
Apparent consumption	1035	1311.5	1305.5	1298
Pulp and paper	617.5	612.5	571.5	531.5

CHLORINE

UNITED STATES

Uses: Chlorine's major use by the pulp and paper industry is bleaching kraft and sulfite pulps.

Demand: In 1982, the pulp and paper industry used an estimated 1.2 million tons of chlorine (13% of total demand), compared with 1.4 million tons in 1981. The largest end-use is in ethylene dichloride (EDC), and others are organic and inorganic chemicals, and water treatment.

Sources: At least 25 companies in the U.S. produce chlorine and caustic. The major chlorine producers (in descending order of nameplate capacity) include Dow Chemical, PPG Industries, Diamond Shamrock, Hooker Chemicals (Occidental Petroleum), Olin, Georgia-Pacific, Vulcan Materials and Pennwalt. Imports, all from Canada, reached a level of205,000 tons in 1982.

Availability: There is ample industry capacity to handle any increase in chlorine demand. 1982, market; 1981, market; 1980, market; 1979, tight to very tight; 1978, market.

Pricing: For the first time in almost 18 months, the price of chlorine has risen industry-wide. Olin boosted the off-list price by $20/ton in September 1982, and this has held. Pricing history (list price): 1982, $145/ton, f.o.b. works, freight equalized; 1981, $145/ton; 1980, $145/ton; 1979, $135-$150/ton; 1978, $135-$145/ton.

Forecast: Over the long term, pulp mill chlorine use will gradually decrease, just as chlorine dioxide substitution increases. However, 1983 pulp mill consumption will be back to the 1.4 million tons consumed in 1981 if production is up.

CANADA

Uses: Chlorine's major use by the pulp and paper industry is as a bleaching agent in kraft and sulfite pulp mills. Onsite hypochlorite makeup consumes additional quantities.

Demand: An estimated 531,500 tons of chlorine were required by the pulp and paper industry in 1982, a decrease of 40,000 from 1981. The industry used 39% of total demand in 1981, compared with the 43% in 1980 and the 56% in 1979. This change is due to the increase in consumption for EDC production. The production of organic and inorganic chemicals takes most of the rest.

Sources: Major merchant producers include (in descending order of nameplate capacity) Dow Chemical Canada, C-I-L, Canadian Occidental Petroleum, Stanchem Div., PPG Industries, and FMC Chemicals. The three captive producers are Great Lakes Forest Products, Prince Albert Pulp (Saskatoon Chemicals), and St. Anne Chemical. Canso Chemical closed in 1981.

Availability: Although the industry operating rate in 1982 was an estimated 85% (vs 80% in 1981), there were no shortages due to decreased domestic demand. 1982, market; 1981, market; 1980, market; 1979, tight; 1978, tight.

Pricing: There was only one price increase for chlorine in 1982 (Apr. 1) as was the case last year (Oct. 1). Pricing history: 1982, $254-$281.20/ton, bulk, f.o.b. works; 1981, $225-$254/ton; 1980, $195-$255/ton; 1979, $163-$195/ton; 1978, $145-$163/ton.

Forecast: Over the long term, chlorine dioxide replacement will reduce pulp mill chlorine usage, but the rate of decrease will be lower than originally predicted. Only four mills are currently replacing more than 25% of their chlorine. If pulp markets begin to improve next year, chlorine usage by the mills could exceed 545,000 tons by 1983.

Mr. Shockett is consulting editor-chemical markets for PULP & PAPER

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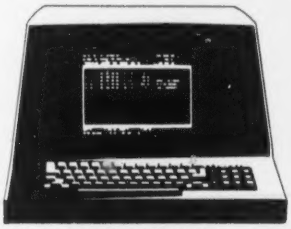

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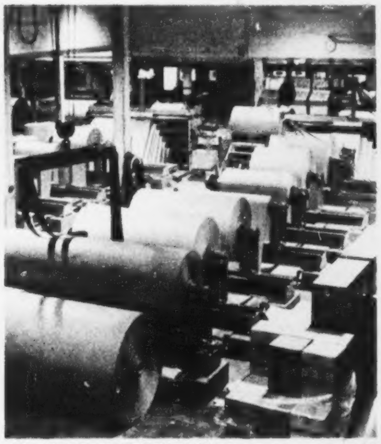

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COVER: *Operation of Union Camp's new oxygen bleaching system at Franklin, Va., is optimized by modern computerized instrumentation. Photo courtesy of Airco Industrial Gases, Murray Hill, N.J.*

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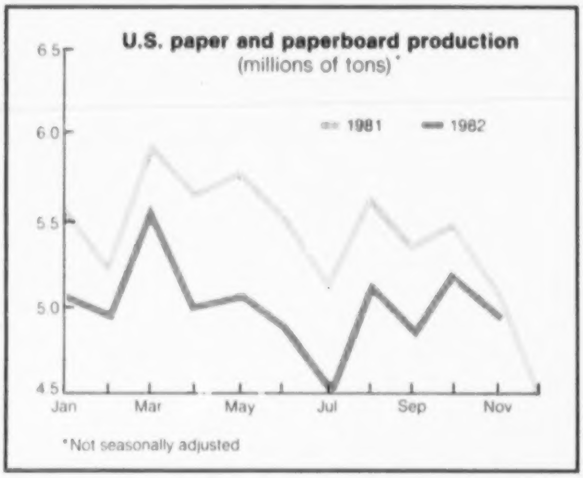
MONTH IN STATISTICS

U.S. paper and paperboard production in November totaled 5.1 million short tons, 0.5% above the November 1981 total, according to the American Paper Institute. The production trend, as measured by the two-month moving average of the seasonally adjusted data, was 60.6 million tpy, slightly below the October trend level. Through November, output was at a seasonally adjusted rate of 59.8 million tpy, 4.6% below year ago.

Among major grades, coated paper output continued to show the strongest trend, and for the year-to-date averaged 5.05 million tpy, up 1.8% over 1981 levels. Newsprint production has now moved below its first-half 1982 rate, but should end the year above the 5-million-ton level. Paperboard output has moved downward during the past two months, and for the first 11 months of the year the seasonally adjusted rate came to 29.4 million tpy, down 6.7% from year ago.Z

Total Canadian newsprint shipments in November came to 692,000 metric tons, down 10.6% from November 1981, according to the Canadian Pulp & Paper Assn. Newsprint mill operating rates rose to 80% from 76% in October, but were well below the 97% rate of a year earlier.


U.S. paper and paperboard production
(millions of tons)*

*Not seasonally adjusted

		Latest month (000 short tons)	% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION[1]					
Newsprint	November	411	−9.5	5,104	−3.4
Uncoated groundwood (s)	November	123	4.2	1,452	−1.3
Coated paper (s)	November	431	8.0	5,053	1.8
Uncoated free sheet (s)	November	651	3.3	7,876	−1.4
Unbleached kraft packaging and industrial (s)	November	327	−0.3	3,690	−6.1
Tissue	November	366	−2.4	4,410	−2.9
Total paper	**November**	**2,541**	**−3.9**	**30,514**	**−2.6**
Kraft linerboard, unbleached	November	1,220	3.9	13,844	−6.9
Semichemical medium	November	371	−0.8	4,423	−7.9
Bleached paperboard	November	303	−3.8	3,727	−6.3
Recycled paperboard	November	543	—	6,691	−6.2
Total paperboard	**November**	**2,511**	**1.3**	**29,743**	**−6.7**
Total paper and paperboard*	**November**	**5,053**	**0.5**	**60,257**	**−4.6**
PULP, WASTEPAPER & FIBER[2]					
Total woodpulp production	October	4,228	−5.2	49,927	−5.7
Market pulp production	October	464	−17.0	5,767	−8.5
Wastepaper consumption at paper/board mills	October	1,210	−10.0	13,802	−3.5
Pulpwood consumption (cords)	November	6,891	−2.4	79,680	−1.8
CONVERTED PRODUCTS STATISTICS[3]					
Corrugated box shipments (billion ft²)	November	19.043	4.0	217.378†	−4.9
Containerboard inventories at box plants	Nov. 1	2,424	−0.5		
INTERNATIONAL TRADE[2]					
U.S. paper imports (including products)	October	740	−5.6	8,035	−3.8
Imports of Canadian newsprint	October	n.a.	n.a.	n.a.†	n.a.
U.S. paper exports (including products)	October	373	13.0	4,313	−9.1
Exports of unbleached kraft linerboard	November	145	−4.6	1,892	−1.8
Exports of woodpulp	October	237	−13.8	3,435	−7.5
CANADIAN STATISTICS[4] (reported in metric tons)					
Total newsprint shipments	November	692	−10.6	7,329†	−9.7
Operating rates	November	80%	97%	83%	94%
Inventories held by U.S. consumers	Nov. 30	1,308	−11.6		
Woodpulp shipments (export only)	November	504	0.6	5,311†	−12.1
Operating rates	November	68%	88%	76%	87%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fiber Box Assn., Paperboard Packaging Council. 4. Canadian Pulp & Paper Assn.
*Includes construction and wet machine grades. †Not annualized. ‡Not directly comparable to year ago because of coding change. (s) = shipments.

LABOR

Box plant strikes finally settled

Operations at corrugated box plants throughout Ontario and Quebec, some of which have been on strike since July, were expected to resume in the first week of January. Contracts were signed at about half of the facilities during the fall, and in December the remaining struck sites ratified agreements, thus ending negotiations which involved some 3000 workers at some 20 plants. The companies, however, are not sure when there will be enough orders to start up, said one labor executive.

Some of the plants which settled earlier have returned to work but are operating well below capacity. The container industry in eastern Canada, 65% of which was shut down at one point by the strike, has lost considerable market share in recent months to U.S. producers, observers say. In addition, demand for boxes is seasonally weakest in the first quarter.

The new contracts are patterned after a settlement involving CIP Inc. facilities of 10%/9%/7% over three years, with adjustments among the various companies to achieve pay parity among various producers in the converting segment of the industry by 1985. MacMillan Bloedel Ltd.'s settlement was slightly lower, while Kruger Inc.'s and Domtar Inc.'s were somewhat higher.

Workers were unsuccessful in their goal of achieving pay parity with primary pulp and paper mills in eastern Canada where members of the same union won a 22% wage boost over two years in a contract settlement last spring.

- **Canadian Paperworkers Union members** voted down a proposal to merge with the Energy & Chemical Workers Union by 54% at a December convention, according to an observer. Union officials were unavailable for comment. Earlier in 1982, ECWU membership approved the merger.

EMPLOYMENT

Third-quarter mill wages jump 5%

Hourly wages of paper mill employees rose a hefty 5.1% in the third quarter from June levels, to $11.38/hour. Weekly hours worked also rose slightly during the quarter, bringing weekly paychecks to $506.41 before overtime, up 6.1% over June levels, according to Bureau of Labor Statistics data. In the meantime, overtime hours jumped from 5.7 hours/week to 7.0 hours.

For production workers at paperboard container and box plants, hourly wages also climbed—at a slower pace—in the third quarter. However, weekly hours worked declined slightly, bringing weekly paychecks to $340.25, up only 2.6% over June levels. Overtime hours also jumped at container and box plants—rising to 3.4 hours/week from 2.9 hours in June.

Production worker employment in the paper and allied products industry rose to 493,600 in September from its June low point of 489,000, but was still 6.3% below its year-earlier peak of 527,000 workers.

The total number of women workers in the paper and allied products industry continued to drop in the third quarter, although August levels of 152,500 were up slightly from the July trough of 151,900. The number of women workers has steadily declined since its peak of 165,000 workers in September 1981.

Average earnings and hours of production workers in the paper and allied products industry

	Sept. 1982	June 1982	% change for quarter	Sept. 1981	% change year ago
Paper & allied (SIC 26)					
Hourly earnings	$9.63	$9.27	3.9%	$8.95	7.6%
Weekly hours	41.7	42.0	−0.7	43.2	−3.5
Overtime hours	4.6	3.9	17.9	5.6	−17.9
Weekly earnings	401.57	389.35	3.1	386.64	3.9
Pulp & paper mills*					
Hourly earnings	$11.38	$10.82	5.2%	$10.63	7.1%
Weekly hours	44.5	44.1	0.9	46.6	−4.5
Overtime hours	7.0	5.7	22.8	8.9	−21.3
Weekly earnings	506.41	477.16	6.1	495.36	2.2
Paperboard containers & boxes					
Hourly earnings	$8.36	$8.13	2.8%	$7.67	9.0%
Weekly hours	40.7	40.8	−0.2	41.2	−1.2
Overtime hours	3.4	2.9	17.2	3.7	−8.1
Weekly earnings	340.25	331.70	2.6	316.00	7.7

*Does not include figures for paperboard mills, which are similar.
Source: Dept. of Labor, Bureau of Labor Statistics.

Executives' salaries up 15% in 1981

Top executives in the pulp, paper, paperboard and converted products industry posted an average 15% earnings increase in 1981, according to a new study of executive pay conducted by Arthur Young & Co. for the Financial Executives Institute. The 15% salary hike matched the 1980 increase for top paper industry executives and surpassed the 13% increase registered by U.S. executives in 27 major industries in 1981.

The New York, N.Y.-based consulting firm surveyed 33 paper products companies and found that top executives earned an average total compensation of about $150,420, ranking sixth among the 27 industry groups in the study. Chief executive officers at paper companies at all levels of sales volume were paid an average of $299,407, up 16% over 1980. Average earnings for other top paper industry executives were: top financial officer, $143,070, up 13%; top legal executive, $140,214, up 15%; top strategic planner, $103,239, up 7%; top human resources executive, $91,916, up 14%.

DOWNTIME

WFP to close Squamish pulp mill

Western Forest Products Ltd.'s 570-tpd bleached kraft pulp mill in Squamish, B.C., will be idled indefinitely starting Feb. 11 because of weak markets, said a company spokesman. A date for reopening the mill will be reviewed sometime in May, he said.

The mill, which came on-line in 1964, is inefficient to operate in the current competitive market, said the spokesman. It was also shut down for 21 days, Dec. 12 to Jan. 3.

Linerboard: Pickup in demand, limited capacity growth should help operating rates in recovery

Statistics	**1981**	**1982p**	**1983e**
Production, 000 tons	14,540	13,575	14,310
Capacity, 000 tons	15,372	15,928	16,063
Utilization rates	94.6%	85.2%	89.1%
Imports, 000 tons*	30	25	25
Exports, 000 tons*	1822	1800	1950
Apparent U.S. consumption			
000 tons	12,748	11,800	12,385
lb/capita	111.0	101.7	105.8
000 tons/$billion real GNP	8.48	8.01	8.18

p = preliminary e = estimate *Commerce Dept. data

Grade structure: Unbleached linerboard is made in a wide range of basis weights. The standard kraft liner is 42 lb/1000 ft^2, but other important grades are made in weights of 26, 33, 38, 69, and 90 lb. Major use is in domestic corrugated container production, although about 13% of output is exported. About 300,000 tons of recycled "test" liner is produced in the U.S. but is excluded from these figures.

Production/capacity: Unbleached liner production in 1982 dropped about 6.6% to 13.57 million tons, reflecting a 4.5% decline in corrugated box shipments, flat export demand, and inventory liquidation. Corrugated box shipments were depressed by the overall slump in U.S. industrial production and hit a four-year low of about 235 billion ft^2.

Export liner shipments continued to be hurt by the weak world economy and strong U.S. dollar, although at about 1.8 million tons, were only off 1.2%, after a 21.5% decline in 1981 from 1980's peak of 2.29 million tons.

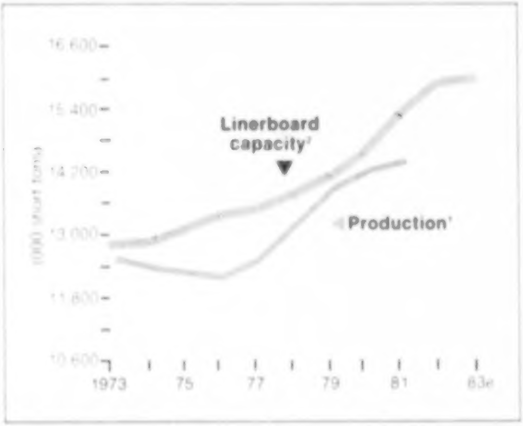
Containerboard inventories (both liner and corrugating medium) dropped from a high of 2.7 million tons at the beginning of 1982 to around 2.4 million tons at year end—a decline of roughly 300,000 tons—which was achieved by heavy production curtailments.

While liner production last year sank to its lowest level since 1978, capacity has continued to rise, causing operating rates to plunge from a high of 98.2% in 1979 to about 85% in 1982. Last year alone, capacity jumped 3.6%, reflecting the startup of two new machines in late 1981 and Weyerhaeuser's new machine at Valliant, Okla., in mid-1982.

Pricing: Price discounting erupted in the winter of 1981 and then occurred again in the late spring of 1982, as producers fought for market share in the face of weakening demand. By November the rebated price of 42-lb liner had eroded to $250/short ton and lower from its previous list of $300. (Year-end transaction prices have been as follows: 1981, $270/ton; 1980, $270/$300; 1979, $270; 1978, $220; 1977, $195; 1976, $210; 1975, $202.)

U.S. export prices in northern Europe began to erode in the fourth quarter of 1981 from a list price of $440/metric ton c.i.f. and by the end of 1982 had reached $280 to $300/metric ton and lower.

At current price levels, most U.S. linerboard mills are probably operating at a loss. This situation is discouraging new capacity additions and is also leading to the closure of some high-cost older facilities.



Estimated annual capacities of major U.S. companies are:

	Annual capacity¹ (000 tons)	Capacity share (%)
1. International Paper	1850	11.5
2. Weyerhaeuser	1390	8.7
3. Union Camp	1355	8.4
4. St. Regis Paper	930	5.8
5. Champion International	910	5.7
6. Container Corp. of America	745	4.6
7. Inland Container (Time)	735	4.5
8. Continental Forest Industries	705	4.4
9. Owens-Illinois	695	4.3
10. Great Northern Nekoosa	650	4.0
11. Westvaco	618	3.8
12. Stone Container	582	3.6
13. Packaging Corp. of America	565	3.5
14. Mead²	545	3.4
15. Willamette	520	3.2

Total U.S. capacity (1982): **16,063 million tons**
Capacity share of top 5 companies: 40.0%
Capacity share of top 10 companies: 62.0%

1. Swing tonnage makes exact capacity estimates difficult.
2. Includes 50% share in Georgia Kraft Corp., with all liner from the Phenix City, Ala., coated kraft board mill assigned to Inland Container.

Outlook: Linerboard production in 1983 is projected to rise 5.4% to 14.3 million tons, based on a 5.1% rise in corrugated box shipments, to around 247 billion ft^2, about an 8% rise in export shipments, and a further 100,000-ton reduction in containerboard stocks.

With only 0.8% capacity growth expected this year, operating rates should rise to around 89%.

With further improvement in demand and limited capacity additions in 1984 and 1985, operating rates for liner should be among the highest for any grade.

This will enable producers to raise prices rapidly and restore profitability.

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Capacity additions in 1983-85 lower than previously expected

Growth to be most pronounced in printing and writing papers, while newsprint increase slows—and construction capacity falls sharply

By DEBRA A. ADAMS, News Editor

☐ Capacity increases at U.S. paper and paperboard mills in 1982 were even less than had been expected when figures were adjusted downward last year, and this slowing trend will continue through 1985, according to American Paper Institute's latest capacity survey. Capacity for all grades of paper and board, excluding construction grades, rose to 70.2 million short tons in 1982—158,000 tons lower than estimated in last year's survey. The growth rate for 1981 to 1984 is down 0.3% from last year's figures to 2.1%.

Printing and writing papers capacity will expand the most during the 1983-85 period, at a rate of 3.3%/year. Smaller increases will occur in newsprint (2.0%), mechanical pulp (1.9%) and sulfate and soda pulp (1.7%). Declines in capacity are expected in construction paper and board (-1.4%) and pulp (-0.4%), packaging and industrial converting (-0.5%), and dissolving and special alpha pulp (-0.1%).

Paper and board capacity, including construction grades, is expected to go up just 1.7% annually over the next three years, reaching 73.8 million tpy in 1985, compared to a 2.2% average annual growth rate in a 15-year period from 1968 to 1982. Pulp capacity should rise by 1.5% from 1983 through 1985, compared to a 2.4% growth rate in the preceding 15 years.

Capital expenditures at pulp, paper and board mills and converting plants declined in 1982 from 1981 by

TABLE 1. **U.S. pulp and paper industry average annual capacity growth**

	1968-82	1983-85
Total paper/board	**2.4%**	**1.7%**
Total paper	**2.7**	**2.1**
Newsprint	4.4	2.0
Printing/writing	3.1	3.3
Packaging, industrial converting	0.6	(0.5)
Tissue	2.7	1.2
Total paperboard	**2.2**	**1.3**
Unbleached kraft	3.4	1.2
Solid bleached	1.7	0.5
Semichemical	2.8	1.6
Recycled	0.2	1.6
Total construction grades	**(1.0)**	**(1.4)**
Total woodpulp	**2.4**	**1.5**
Dissolving, special alpha	(0.1)	(0.1)
Sulfite	(2.7)	0.2
Sulfate and soda*	3.0	1.7
Semichemical	1.7	0.9
Mechanical	2.4	1.9
Pulp for construction grades	0.3	(0.4)

*Includes screenings

TABLE 2: **Paper/board annual capacity, 1982-85** *(000 short tons)*

	1982	1983	1984	1985
Total paper/board	**70,197**	**71,155**	**72,455**	**73,808**
Total paper	**34,695**	**35,427**	**36,280**	**36,944**
Newsprint	5,654	5,752	5,955	5,994
Printing/writing	17,827	18,468	19,052	19,647
Uncoated groundwood	1,742	1,747	1,749	1,749
Coated groundwood	3,312	3,625	3,686	3,741
Coated free-sheet	2,271	2,412	2,501	2,559
Uncoated free-sheet	8,937	9,049	9,439	9,900
Cotton fiber	152	158	159	100
Thin papers	373	374	374	374
Solid bleached bristols	1,039	1,103	1,154	1,163
Packaging & industrial converting	6,042	5,997	6,014	5,949
Unbleached kraft	3,987	3,932	3,928	3,880
Bleached packaging and industrial converting	608	612	612	600
Specialty packaging	531	528	532	524
Special industrial	916	924	941	945
Tissue	5,172	5,210	5,249	5,354
Total paperboard	**35,501**	**35,728**	**36,175**	**36,862**
Unbleached kraft	17,313	17,361	17,446	17,933
Kraft linerboard	15,928	16,063	16,157	16,642
Solid bleached	4,184	4,198	4,239	4,245
Semichemical	5,237	5,249	5,479	5,535
Recycled	8,731	8,920	9,011	9,149
Total construction paper/board	**3,305**	**3,183**	**3,167**	**3,169**

$300 million to $5 billion after posting a gain of $74 million in 1981 from the previous year. Total paper company spending was $6.3 billion in 1982, 6.6% less than in 1981 and 7.6% below the 1980 high.

Expenditures have remained relatively high, however, in view of the decline in the industry's total cash flow, which dropped to $3.1 billion compared to $4.3 billion in 1981 and $3.8 billion in 1980, said API senior vice president Norma Pace. By using creative financing, including safe harbor leasing and the sale of some assets, expenditures were maintained somewhat, she noted.

Newsprint growth falters

Unprecedented growth rates in newsprint over the last three years, boosting capacity by 35% or 1.5 million tons, will come to a sudden halt in 1983. Only one newsprint machine is scheduled to come on-line next year and capacity is expected to grow just 6% over the next three years to 5.9 million tons by 1985.

A glut of newsprint is expected through 1984 due to production overcapacity combined with a decline in consumption. The only U.S. machine scheduled to start up in 1983 is one at Augusta Newsprint Co.'s mill in Augusta, Ga. A number of newsprint projects which were slated to get underway in 1982 and later have been indefinitely delayed until market conditions improve.

Several older machines in Canada and the U.S. have been idled indefinitely or shut down permanently during 1982 due to increased competitive pressure. Much of this newsprint capacity should be removed from capacity totals during 1983.

Printing and writing papers capacity will grow at the fastest rate in the industry over the next three years. Uncoated free-sheet capacity will increase 1 million tons to 9.9 million tpy during 1983-85, including 114,000 tons which have been idle for several months. Coated groundwood and coated free-sheet capacity will be up 4.1%/year during the the next three years for a net increase of 429,000 tons and 288,000 tons, respectively, by 1985.

Recycled paperboard expanding

A marked improvement in growth is projected for recycled paperboard capacity, which is expected to increase 418,000 tons by 1985, representing a 1.6% annual growth in the 1983-85 period compared to a previous 12-year decline when machine shutdowns amounting to 2.5 million tons more than offset any gains in capacity.

Clay-coated news consumption has been fairly strong during the recession, and some observers feel that it captured some market share from solid bleached sulfate paperboard and will remain strong in the long term. An increase in recycled capacity, which observers have felt would be imminent considering the number of obsolete machines now operating, will likely be in clay-coated.

Just 61,000 tons of capacity is expected to be added in solid bleached paperboard during the next three years, bringing the total 1985 capacity to 4.2 million tons, according to API. International Paper Co., however, tentatively plans to raise SBS capacity by 150,000 tpy by 1985 in projects related to the company's mills in Pine Bluff, Ark., and Georgetown, S.C., though a 50,000-tpy expansion for Pine Bluff has not yet been approved.

An expected reduction in unbleached kraft paper capacity of 107,000 tons to 3.8 million tpy by 1985 is at-

TABLE 3: **Woodpulp annual capacity, 1982-85** *(000 short tons)*

	1982	1983	1984	1985
Total woodpulp	**57,803**	**58,064**	**59,208**	**60,448**
Dissolving	1,547	1,542	1,542	1,542
Chemical paper grades	44,030	44,321	45,039	46,226
Sulfite paper grades	1,797	1,785	1,804	1,810
Sulfate, soda paper grades	42,233	42,588	43,235	44,416
Bleached softwood*	12,023	12,258	12,739	13,137
Bleached hardwood*	8,688	8,861	9,090	9,533
Unbleached	21,523	21,437	21,406	21,746
Semichemical	4,768	4,641	4,866	4,904
Mechanical	5,780	5,904	6,015	6,120
Screenings	54	54	54	54
Total machine-dried pulp	**9,416**	**9,617**	**9,844**	**10,295**
Dissolving	1,547	1,542	1,542	1,542
Chemical paper grades	7,767	7,974	8,200	8,052
Sulfite	467	432	432	432
Sulfate	7,123	7,357	7,583	8,035
Unbleached sulfate	177	185	185	185
Other	102	102	102	102

*Includes semibleached

TABLE 4: **Market pulp capacity, 1982-85** *(000 short tons)*

	1982	1983	1984	1985
Total market pulp	**6951**	**7014**	**7208**	**7648**
Dissolving	1540	1534	1534	1534
Chemical paper grades	5401	5469	5663	6103
Sulfite	263	257	257	257
Sulfate	5138	5212	5406	5846
Bleached*	4989	5062	5254	5695
Unbleached	150	151	152	152
All other	10	10	10	10

*Includes semibleached

TABLE 5: **Mills and machines shut down, 1980-82***

	Machines	Mills	Annual capacity (000 short tons)
Paper			
Newsprint	—	—	—
Printing/writing	24 (1)	4	375 (39)
Packaging and industrial converting	18 (1)	6	283 (34)
Tissue	28	11	274
Paperboard			
Unbleached kraft	5 (2)	—	512 (280)
Bleached kraft	—	—	—
Semichemical	6	2	458
Recycled	19	9	519
Construction grades	67 (2)	45 (2)	1348 (34)
Total	**167 (6)**	**77 (2)**	**3769 (387)**

*Numbers in parentheses are shutdowns announced for 1983-85; not included in totals.

tributed to swings in machine time to kraft paperboard production as well as the shutdown of one machine.

Delays in capital expansion projects and the shutdown of machines in two southern mills will result in 1983-85 linerboard capacity additions amounting to only 620,000 tons, the lowest increase in any three-year period in the past decade.

Permanent shutdowns of machines totaling 286,000 tons is expected to slow the pace of growth in the semichemical paperboard market over the next three years. During that period capacity should rise 1.6% annually for a total gain of 262,000 tons compared to a 5.7% growth rate or 285,000 tons in 1982.

Conversion of felt-based roofing to fiberglass-based shingles has resulted in the elimination of 36 roofing mills with a combined capacity of 878,000 tons from total construction paper and board capacity. In 1983, capacity will fall 900,000 tons from 1981 levels to 3.2 million tons. Marginal further shutdowns are projected for 1983-85, but market observers say that based on the trend in the last three years, it would be hard for API accurately to forecast future conversion to fiberglass and its impact on construction grade capacity.

Major pulp additions in soda and sulfate

Pulp capacity will increase 2.7 million tons, reaching 58.8 million tpy in 1985, with sulfate and soda pulps accounting for over 80% of total woodpulp expansion during the next three years. While the annual growth rate for sulfate and soda pulps will be lower than in the previous 15 years—1.7% compared to 3%—capacity will rise by 2.2 million tons, to 44.1 million tons by 1985.

TMP additions will amount to just 17,000 tons in the period 1983-85, corresponding with the expected rate of decline in stone groundwood pulp. This contrasts with previous capacity increases in TMP, and reflects a reduction in the rate of growth in newsprint capacity.

Market pulp capacity will rise to 5.7 million tpy in 1985 by an expected 4.5% growth rate in bleached sulfate market paper grade pulp capacity over the next three years. At least 175,000 tpy of the 706,000-ton total increase is reportedly designated for the export market.

Wastepaper consumption is expected to increase over the next three years as a result of more mills substituting secondary fiber for virgin pulp. The proportion of secondary fiber used in papermaking is expected to increase to 56.2% in 1985 from 55.3% in 1981.

No shortages of paper stock are expected, however, because increases in wastepaper consumption should occur slowly, and collection systems in the U.S. are expected to readily absorb the gradual additional demand.

The 29 pulp, paper and paperboard projects planned in the period 1981-1985 are expected to increase the U.S. industry's annual capacity by 5 million tons by the mid-1980s. The bulk of these expansions occurred in 1981, providing 2.4 million tons of additional capacity. Just one project is planned for completion in 1985, and that will boost uncoated free-sheet capacity at Crown Zellerbach's Camas, Wash., mill by 160,000 tpy.

The South, which held a 51.1% share of paper/board capacity and 67.3% share of major pulp grades capacity in 1981, will continue to hold a predominant share of industry capacity. During 1983-85, 59.6% of total paper/board capacity increases and 87.6% of new woodpulp capacity growth will be in the South. ☐

TABLE 6: **Announced major capacity additions**

Company	Location	Grade	Annual capacity
Mead	Escanaba, Mich.	Coated groundwood	200
Portals	Hawkinsville, Ga.	Cotton fiber	3
St. Regis	Sartell, Minn.	Coated groundwood	170
Weyerhaeuser	Columbus, Miss.	Coated groundwood	175
Weyerhaeuser	Valliant, Okla.	Unbl. kraft liner	200
Wisconsin Tissue	Menasha, Wis.	Tissue	65*
1983			
Augusta Newsprint	Augusta, Ga.	Newsprint	225
MacMillan Bloedel	Pine Hill, Ala.	Semichem. paperbd.	210
Scott Paper	Skowhegan, Maine**	Coated free-sheet	200
1984			
Champion	Courtland, Ala.	Uncoated free-sheet	150
Independent Kraft	Tuscaloosa, Ala.	Unbl. kraft liner	280
Leaf River	New Augusta, Miss.	Bleached kraft pulp	355
Union Camp	Eastover, S.C.	Uncoated free-sheet	215
1985			
Crown Zellerbach	Camas, Wash.	Uncoated free-sheet	160

*Will replace existing facilities; net increases not announced.
**Started up Dec. 12, 1982.

Reduced caustic demand keeps prices low

By BARRY SHOCKETT

Although there was a slight improvement in the fortunes of the U.S. pulp and paper industry in the second half of 1982, total output for the year was down an estimated 4.5% over 1981.

The chloralkali industry was severely depressed, averaging no more than a 60% operating rate (chlorine basis) for the year, leading to several plant closures.

Pulp and paper output in Canada dropped to a greater extent. At the ten-month mark in 1982, pulp production was down 10%, while total paper output was off almost 8% over 1981 levels. Paperboard production, which was affected by a lengthy strike in eastern Canada at corrugated carton plants, was 16% below 1981.

Caustic demand by pulp mills was down between 5% and 6% reflected in the reduced mill operating rate of 77% for the January-October period, compared with 87% in the 1981 period.

U.S. statistics, sodium hydroxide (000 short tons)

	1979	1980	1981	1982e
Capacity (est)	14,480	14,500	14,600	15,100
Production	12,759	11,625	10,648	9,500
Imports	183.5	132	246	400
Exports	1484.5	1413	1330	800
Apparent consumption	11,458	10.344	9564	9100

Source: Bureau of Census, U.S. Dept. of Commerce

Canadian statistics, sodium hydroxide (000 short tons)

	1979	1980	1981	1982
Capacity	1504	1896	1908	1975
Production	1254	1608	1606.5	1576
Imports	378.5	249	238	220.5
Exports	68.5	101.5	156.5	220.5
Apparent consumption	1564	1755.5	1688	1576
Pulp and paper	971	1,030	990.5	935

CAUSTIC SODA

UNITED STATES

Uses: Most of the sodium hydroxide (NaOH) consumed by the pulp and paper industry is purchased by kraft and bleached sulfite pulp mills, the major application being for caustic extraction. Other important uses include organic and inorganic chemicals production, textiles, and aluminum processing.

Demand: The sluggish economy resulted in a reduced caustic consumption by the pulp mills in 1982 of an estimated 1.7 million tons (almost 18% of the estimated 9.5 million tons produced). Mill usage in 1981 was reported to be an estimated 1.9 million tons out of a total caustic production of 10.65 million tons. Imports increased to 400,000 tons in 1982, with 75% coming from Canada.

Sources: Caustic is a coproduct of chlorine production. Producers are listed in the January issue of PULP & PAPER, p. 207. There were several closures in 1982.

Availability: There were no supply problems in 1982, and none are expected in the first half of 1983. 1982, tight to market; 1981, very tight to tight; 1980, very tight; 1979, market; 1978, market.

Pricing: Some producers dropped caustic list prices to conform more with market price. At the beginning of1983, a new list price, $240/ton f.o.b. Gulf Coast area, went into effect. Higher listings prevail elsewhere. In New Jersey, Maryland, and Ohio, the new list price is $270/ton, and in northern New York state and Michigan it is $275/ton. The list price is $290/ton in the Pacific Northwest. Pricing history (list price): 1982, $315/ton (50% solution, f.o.b. works, freight equalized); 1981, $270-$320/ton; 1980, $167-$200/ton; 1979, $130-$160/ton; 1978, $160-$170/ton.

Forecast: The return to the 1981 caustic demand level by pulp mills in 1983 will probably not occur as previously predicted. Pulp mills will require about 1.8 million tons this year. Prices will remain depressed in the first half of the year, but could rise 10% or 15% on average for all of 1983.

CANADA

Uses: Pulp mills, which consume by far the largest share of the caustic soda produced, employ the sodium hydroxide for the extraction stages in kraft bleach plants, for hypochlorite makeup, and in sulfite pulping. The next-largest end-use areas are in the production of alumina and propylene oxide.

Demand: In 1982, pulp mills consumed about 935,000 tons of caustic (59.5% of total demand), of which 694,000 tons were used in bleaching. In 1981, 990,000 tons were used by pulp mills overall, with bleaching applications consuming an estimated 714,000 tons.

Sources: Caustic is a coproduct of chlorine, and is made by nine firms in Canada. Producers are listed in P&P, January, p.207.

Availability: Although exports increased 40% in 1982, there is sufficient capacity to meet any domestic requirements. 1982, tight to market; 1981, very tight to tight; 1980, very tight; 1979, tight; 1978, tight.

Pricing: Although chlorine prices rose 9.5% as of January 1, 1983, caustic soda list prices remain steady at C$417/ton since April 1, 1982. Prices are not expected to increase before the second quarter. Pricing history is as follows: 1982, C$381-C$417/ton (50% solution, f.o.b. works, freight equalized): 1981, C$293-C$381/ton; 1980, C$195-$293/ton; 1979, C$183-C$195/ton; 1978, C$175-C$183.

Forecast: A 10% boost in caustic soda list prices could occur by April. Paper industry caustic demand is expected to increase an average of 2%/year to mid-decade.

Mr. Shockett is consulting editor-chemical markets for PULP & PAPER.

PULP & PAPER

March 1983

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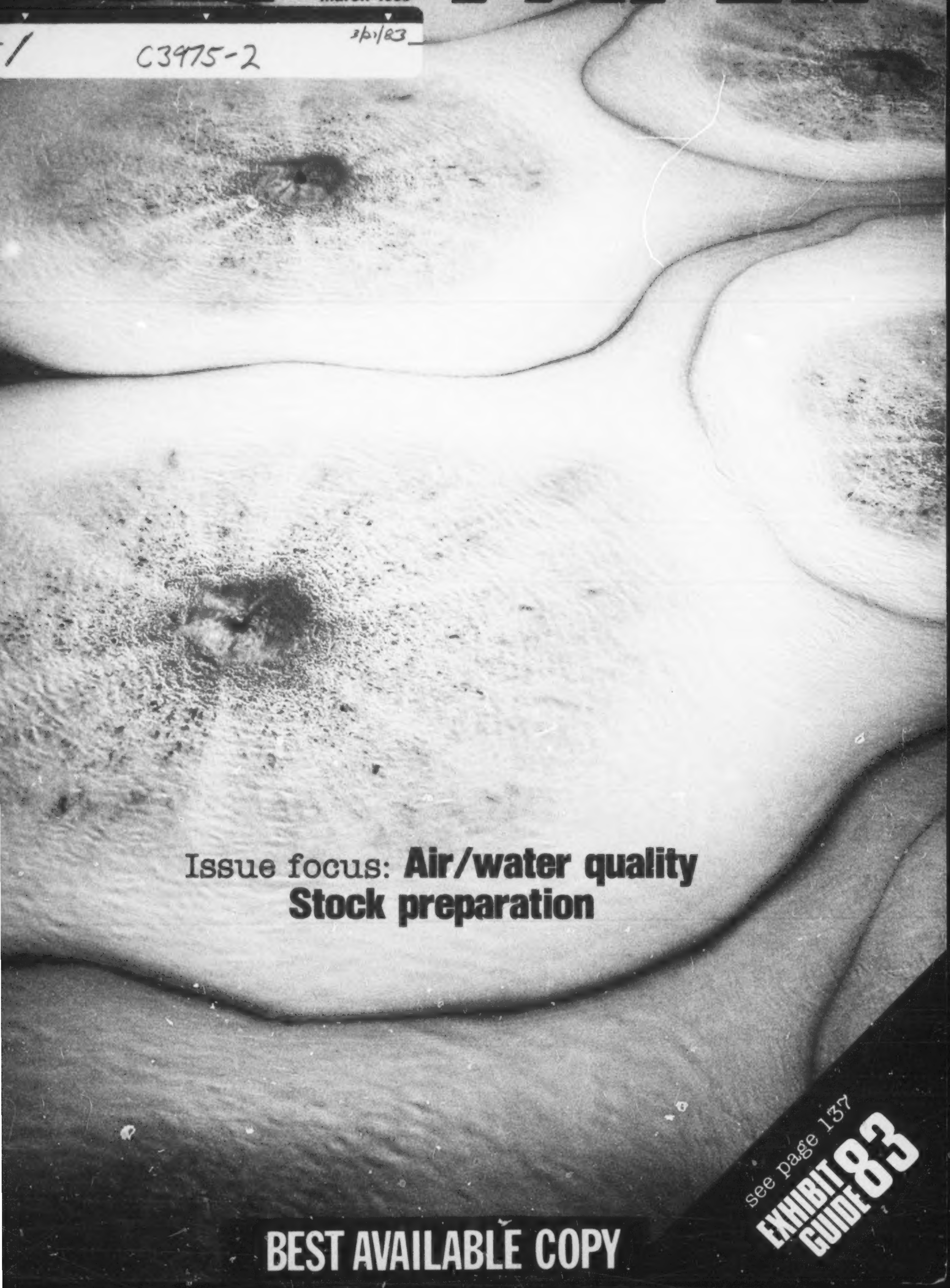

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Stock preparation

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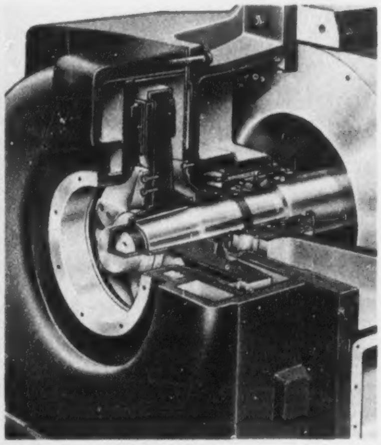

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COVER: *One of this issue's highlights—air/water quality—contains six articles focusing on new environmental technology now being implemented at the mill level. (Photo of aeration pond courtesy of Crown Zellerbach, Port Townsend, Wash.)*

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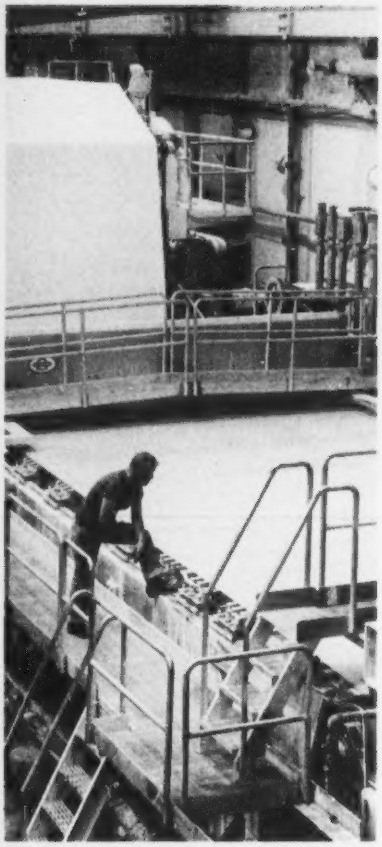

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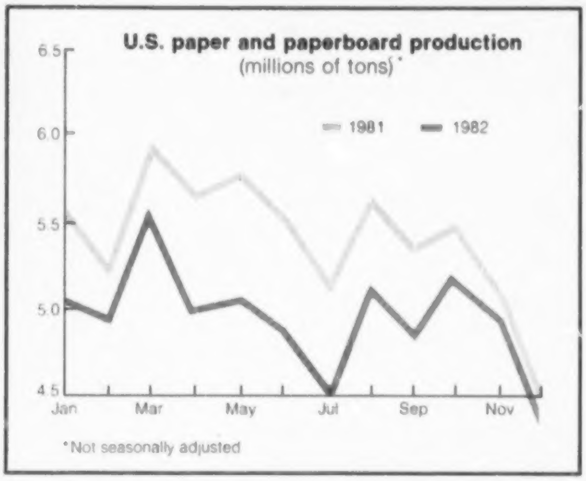
MONTH IN STATISTICS

U.S. paper and paperboard production in December totaled 4.3 million short tons, 0.4% below the December 1981 total, according to the American Paper Institute. The production trend, as measured by the two-month moving average of the seasonally adjusted data, was below the 60-million-tpy level for the first time since August. For the year, total production came to 59.4 million tons, 4.3% below the 1981 total.

Among major grades, uncoated groundwood and free-sheet grades topped year-earlier output levels in December, as did unbleached kraft packaging and industrial grades. Coated paper output continued strong in December, and for the year came to 5.03 million tons, up 1.9% over 1981. Total paper production for the year totaled 30.2 million tons, down 2.3% from 1981. Paperboard production continued its slowdown in December, and for the year came to 29.3 million tons, down 6.3% from 1981.

Total Canadian newsprint shipments in December came to 717,000 metric tons, down 10.4% from December 1981, according to the Canadian Pulp & Paper Assn. Newsprint mill operating rates fell to 71% from 80% in November, and were well below the 96% rate of a year earlier.


U.S. paper and paperboard production
(millions of tons)*

*Not seasonally adjusted

		Latest month (000 short tons)	% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION[1]					
Newsprint	December	363	−8.1	5,041	−3.6
Uncoated groundwood (s)	December	118	3.5	1,452	−0.8
Coated paper (s)	December	399	2.3	5,032	1.9
Uncoated free sheet (s)	December	598	4.0	7,837	−0.8
Unbleached kraft packaging and industrial (s)	December	270	3.8	3,530	−5.2
Tissue	December	345	−2.5	4,388	−2.9
Total paper	**December**	**2,290**	**−1.3**	**30,169**	**−2.3**
Kraft linerboard, unbleached	December	915	0.5	13,589	−6.5
Semichemical medium	December	328	3.8	4,381	−7.2
Bleached paperboard	December	268	0.8	3,682	−5.8
Recycled paperboard	December	464	0.2	6,953	−5.8
Total paperboard	**December**	**2,035**	**0.7**	**29,275**	**−6.3**
Total paper and paperboard*	**December**	**4,325**	**−0.4**	**59,444**	**−4.3**
PULP, WASTEPAPER & FIBER[2]					
Total woodpulp production	November	4,211	−1.8	49,979	−5.4
Market pulp production	November	512	−5.4	5,798	−8.2
Wastepaper consumption at paper/board mills	November	1,108	−9.6	13,631	−3.0
Pulpwood consumption (cords)	December	6,789	5.1	79,483	−1.2
CONVERTED PRODUCTS STATISTICS[3]					
Corrugated box shipments (billion ft²)	December	17.540	−0.3	234.918†	−4.2
Containerboard inventories at box plants	Dec. 1	2,524	−2.9		
INTERNATIONAL TRADE[2]					
U.S. paper imports (including products)	November	722	−1.4	8,092	−3.6
Imports of Canadian newsprint	November	566	−8.7	6,531†	−6.1
U.S. paper exports (including products)	November	308	−11.2	4,257	−9.3
Exports of unbleached kraft linerboard	December	136	18.3	1,871	−0.8
Exports of woodpulp	November	247	−7.5	3,392	−7.5
CANADIAN STATISTICS[4] (reported in metric tons)					
Total newsprint shipments	December	717	−10.4	8,045†	−9.8
Operating rates	December	71%	96%	82%	94%
Inventories held by U.S. consumers	Dec. 31	1,252	−15.2		
Woodpulp shipments (export only)	December	513	−8.1	5,824†	−11.7
Operating rates	December	62%	82%	75%	86%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fiber Box Assn., Paperboard Packaging Council. 4. Canadian Pulp & Paper Assn.
*Includes construction and wet machine grades. †Not annualized. ‡Not directly comparable to year ago because of coding change. (s) = shipments.

FINANCE

U.S. paper profits plummet in fourth quarter

U.S. pulp and paper companies continued to be battered by the recession in the fourth quarter of 1982, as prices remained weak and shipment volumes in most product lines to both domestic and international markets remained below year-earlier levels. Paper companies' earnings tumbled 84% below already-depressed fourth-quarter 1981 levels on a 4.5% decline in sales, according to a PULP & PAPER survey of 21 firms.

Firms with extensive forest products holdings were harder hit: seven firms saw fourth-quarter profits fall 91% on a 0.8% rise in sales. Fourth-quarter earnings for the total paper/forest products industry were down 86% on a 2.5% decline in sales.

Full-year paper industry earnings for the 21 companies were down 46% while forest products earnings for seven firms dropped 65%, bringing the year's earnings for the entire paper/forest products industry down 51%.

IP profits slide. International Paper Co.'s operating net came to $143.6 million, down 46% from full-year 1981. "In 1982 the forest products industry faced the worst overall business environment since the 1930s," said Edwin A. Gee, IP chairman and CEO. "Profits in our wood products and paper businesses suffered seriously. As the year progressed with no improvement, price competition intensified. The pricing environment was particularly severe in the containerboard, pulp, and white paper segments."

Crown Zellerbach Corp. posted a $21.4-million loss from operations for the fourth quarter caused primarily by production curtailments. On top of the loss, CZ also reported a net charge of $125 million from the sale of Crown Zellerbach Canada Ltd. and the restructuring of domestic operations. Full-year earnings were 78% below 1981. Mead Corp. also reported a loss from operations for the quarter—as well as a loss for the full year—due to costs and interest expenses associated with mill expansions. Not included in Mead's figures is an extraordinary charge of $24 million in 1982 for settlement of a corrugated container antitrust suit.

Among major tissue producers, both Kimberly-Clark Corp. and Scott Paper Co. saw fourth-quarther earnings plummet due to the Mexican peso devaluation which diluted earnings from Mexican affiliates. An addition, a strike at the Scott Maritimes pulp mill in Nova Scotia contributed to Scott's earnings falloff.

Wood products hit trough. Despite a brief pickup in December lumber and plywood markets, fourth-quarter earnings for seven major forest products companies were hurt by the double impact of a continuing decline in wood products operations and a sharp falloff in major pulp, paper, and packaging operations. Boise Cascade reported fourth-quarter profits down 80%, full-year profits down 94% from 1981 levels.

Georgia-Pacific Corp. and Weyerhaeuser Co. both took extraordinary charges against 1982 earnings of $56 million and $21.9 million, respectively, for the settlement of plywood antitrust litigation. The charge caused G-P to post a $43-million loss in the fourth quarter and brought full-year earnings 68% below 1981.

Canadian firms in red. Plummeting prices and demand, particularly for pulp and newsprint, caused most Canadian pulp and paper companies to post substantial losses for the fourth quarter—and several for the full year as well. Wood products markets remained stagnant throughout 1982, but did pick up slightly at the very end of the year.

Six firms reporting showed a combined loss of $24 million for the quarter and $19 million for the year. Fourth-quarter sales for the firms were 8% below year-earlier levels, while full-year sales dropped 6%.

U.S. PAPER/FOREST PRODUCTS RESULTS

	Full Year ($000)			
Paper companies	**Sales**	**Change 1982/81**	**Earnings[1]**	**Change 1982/81**
Chesapeake	$239,900	−15.1%	$8,100	−69.1%
Clevepak	150,195[2]	26.8	4,332[2]	6.3
Consolidated	530,296	−1.2	44,998	−17.7
Crown Zellerbach	2,947,400	−6.4	12,800[3]	−78.3
Federal Paper	509,987	−2.0	16,065	−48.3
Fort Howard	537,030	14.0	92,400	11.3
Glatfelter	247,403	−6.8	19,890	20.5
GN Nekoosa	1,429,700	−4.2	74,500	−21.2
Hammermill	1,395,950	−0.3	30,262	−35.1
Intl. Paper	4,015,200	−19.4	143,600	−45.9
Kimberly-Clark	2,946,100	2.1	197,400	−3.6
Longview (10/31)[4]	371,463	−4.6	3,559	−73.2
Mead	2,666,500	−8.0	(61,784)	n.m.
Mosinee	84,957	−6.5	3,964	−42.7
Pentair	271,085	21.0	10,510	28.9
St. Regis	2,555,949	−9.3	45,028	−74.5
Scott	2,293,436	−0.7	74,457	−44.2
Sonoco	542,492	1.7	28,587	−25.7
SW Forest	582,745	−25.2	(27,389)	n.m.
Union Camp	1,526,014	−8.4	124,021	−26.6
Westvaco	1,449,664	−6.5	63,093	−37.4
Willamette	928,745	−4.8	5,345	−81.3
Total	**28,222,211**	**−7.0**	**913,738**	**−45.7**
Forest products				
Boise Cascade	2,912,450	−6.3	7,250	−94.0
Champion Intl.	3,737,378	−6.7	39,650	−66.9
Georgia-Pacific	5,402,000	−0.2	52,000	−67.5
Louisiana-Pacific	872,190	−14.7	(16,650)	n.m.
Pope & Talbot	257,715	9.1	4,327	59.6
Potlatch	820,180	−6.8	22,533	−41.6
Weyerhaeuser	4,186,224	−7.0	140,016	−40.3
Total	**18,188,137**	**−5.1**	**249,126**	**−64.5**
U.S. total	**46,410,348**	**−6.3**	**1,162,864**	**−51.3**

CANADIAN PAPER INDUSTRY RESULTS

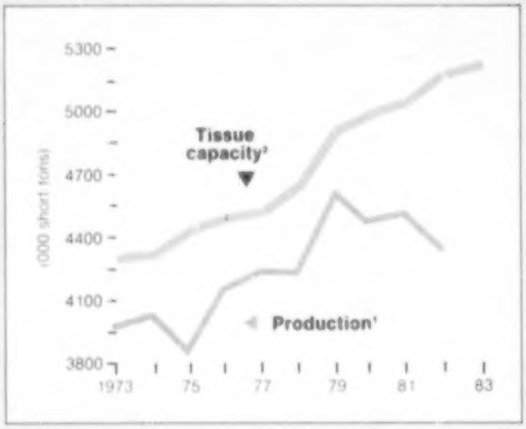
B.C. Resources	C$799,200	−1.9	(61,000)	n.m.
Con-Bathurst	1,424,000	−3.7	53,406	−47.5
CZ Canada	654,700	0.2	(23,300)	n.m.
Domtar	1,686,600	−4.4	9,100	−84.7
Great Lakes	437,854	−23.0	18,552	−77.1
Weldwood	415,201	−13.7	(15,919)	n.m.
Total	**5,417,555**	**−6.0**	**(19,161)**	**n.m.**

1. Income after taxes, from continuing operations, excluding most significant nonrecurring items in both years.
2. Includes results from Torin Corp., acquired July 4, 1982.
3. Does not include net after-tax charge against 1982 earnings of $215 million from sale of Crown Zellerbach Canada and restructuring domestic operations.
4. Period ended. ( ) = loss. n.m. = not meaningful.

Tissue: Higher production, limited capacity growth should lift operating rates in 1983

Statistics	**1981**	**1982**	**1983e**
Production, 000 tons[1]	4518	4388	4530
Capacity, 000 tons[1]	5035	5172	5210
Utilization rates, %	89.7	84.8	86.9
Imports, 000 tons[2]	7	7	7
Exports, 000 tons[2]	52	24	32
Apparent U.S. consumption			
000 tons	4473	4371	4505
lb/capita	38.9	37.7	38.4
000 tons/$ billion real GNP	2.98	2.96	2.98

[1]API data [2]Commerce Dept. data



Estimated capacities of major U.S. companies are:

	Annual capacity (000 tons)	**Capacity share** (%)
1. Scott Paper Co.	1035	19.9
2. Procter & Gamble Co.	900	17.2
3. Fort Howard Paper Co.	565	10.8
4. Georgia-Pacific Co.	500	9.6
5. James River Corp.	435	8.3
6. Kimberly-Clark Corp.	400	7.7
7. Crown Zellerbach Corp.	310	6.0
8. Potlatch Corp.	120	2.3
9. Marcal Paper Mills Inc.	115	2.2
10. Diamond International Corp.	102	2.0
11. APL Corp.	95	1.8
12. Wisconsin Tissue Mills Inc.	90	1.7

U.S. annual capacity (1983): **5.210 million tons**
Capacity share of top five companies: 65.9%
Capacity share of top ten companies: 86.0%

Grade structure: Tissue is composed of two major classes—sanitary and "other." Sanitary tissue includes facial tissue, paper napkins, bathroom tissue, toweling, and basestock for sanitary stock, wadding, and wipers. "Other" includes basestock for waxing, wrapping, and miscellaneous tissue. Sanitary tissue can be further divided into consumer and commercial/industrial grades. Typical basis weights for single-ply toilet tissue are 12 to 14 lb/3000 ft², and for single-ply towel, 32 to 39 lb/3000 ft².

Production/capacity: Tissue production has seesawed through the recession, with tonnage falling 2.9% in 1980, then recovering 3.2% in 1981, and then falling 2.9% in 1982, to 4.39 million tons. Unit volume last year probably performed somewhat better, reflecting a shift to single-ply products as well as lower sheet counts per roll.

While tissue production declined during the 1980-82 period, capacity grew at about a 2.0%/year pace. This reflected the addition of six new tissue machines, which was only partly offset by the shutdown of 28 older, less efficient machines. The result has been a decline in operating rates from 92.5% in 1979 to 84.8% in 1982.

Slack market conditions plus the sharp decline in fiber costs have led to pricing competition. Consumer tissue prices were raised by 2% to 5% in March 1980 and then again by 7% in September 1981, but part of these increases may have been eroded by promotional discounting. Consumers in the early stages of the recession tended to trade down to lower price and performance products, although last year there were indications that the growth in market share of generics and private label products had begun to slow.

Competition has been even more fierce in the smaller commercial/industrial sector of the market, where demand has fallen (due to employee layoffs, lower hotel occupancy rates, etc.), wastepaper costs have dropped sharply, and capacity has either been added or redirected from consumer grades.

Outlook: Tissue production in 1983 is forecast to rise about 3.2%, to 4.53 million tons, and unit shipments will probably jump even more sharply, with improvement in the economy and continued population growth. Capacity is projected to rise by only 0.7% this year, resulting in an operating rate of about 87%. With the startup of a new machine at Wisconsin Tissue Mills last fall, not a single new machine is definitely scheduled to come online in the U.S. over the 1983-85 period (although Fort Howard is studying a fourth unit for its Muskogee, Okla., mill). In addition, an idle "advanced technology" machine at Scott Paper's Everett, Wash., mill, and a temporarily closed air-forming line at Kimberly-Clark's New Milford, Conn., facility may be reactivated.

With a continued production improvement and capacity growth of 1.2% next year, operating rates should improve to 90% to 91% in 1984. This should lead to a rebound in industry pricing and profits beginning this year and accelerating in 1984.

Pricing: The producer price index for all converted sanitary tissue products has shown the following trend (year-end; 1967 = 100): 1970, 115.1; 1972, 121.0; 1974, 155.7; 1975, 194.7; 1976, 214.7; 1977, 236.7; 1978, 253.3; 1979, 279.4; 1980, 343.4; 1981, 349.2; 1982, 362.6. Based on the index, prices at the end of 1982 were only 3.6% higher than a year ago, which in turn were only 1.9% above the end of 1980.

Market: End uses for tissue papers are: 38% toilet (of which 54% consisted of single-ply and 46% of multi-ply); 31% towels; 8% facial tissue; 13% napkins; 2% wipes; 5% other sanitary; and 3% nonsanitary. Nonsanitary tissue production has dropped about 37% over the past five years, to 136,000 tons in 1981, partly reflecting inroads from plastic films in such markets as waxing paper.

Bear Island dewatering 100% TMP sludge, burning in boiler

Sludge at Doswell, Va., mill is thickened by Hydrasieve, dewatered by belt filter press to 30% solids, mixed with bark, and blown to hog fuel boiler

By T.R. HEWITT and ROBERT ELLIS

☐ Bear Island Paper Co. at Doswell, Va., is a 500-tpd newsprint mill utilizing a furnish of 100% thermomechanical pulp (TMP). The mill uses Virginia and loblolly pine as its pulpwood source.

Mill effluent at Bear Island is collected in a single sewer and receives primary and secondary treatment. Primary clarification produces a sludge that is very dissimilar from kraft mill sludges.

This article describes a sludge treatment and dewatering testing program and study that was conducted by J.E. Sirrine Co. for Bear Island in 1980 to determine the optimum method for the mill to handle its sludge.

At the time of the study, Bear Island was unable to dewater and dispose of all of the primary and secondary sludge being produced in the treatment process using existing equipment. The sludge treatment system consisted of two belt-filter presses receiving a 1%-solids slurry. Excess sludge was being directed to an emergency holding basin that was quickly being filled. Three goals were established for the study as requirements for the waste treatment system to operate economically:

1. Identify the most cost-effective sludge treatment method
2. Identify the most cost-effective sludge disposal method
3. Eliminate diversion of sludge to emergency basin.

At the time, no information was available on previous mill experience with 100% TMP sludge. Thus, various methods of thickening and dewatering the sludge were pilot tested to provide the information needed to make an evaluation and to meet these goals.

Sludge characterization

The sludge generated in treating TMP mill effluent is a low-solids slurry that is high in fines content and quite difficult to dewater. The 1% to 2% primary clarifier underflow slurry is like waste biological sludge in some respects. The effect of fiber presence in the sludge is not apparent until the solids content reaches about 5% to 6%.

The most notable feature of TMP wastewater sludge is its fineness. Samples analyzed at the mill showed that about 75% to 85% of its solids passed through a No. 200 sieve. The solids consist of fines and short-length fibers with very high specific surface. The short fiber (averaging 1.0 to 1.2 mm) is less effective in forming a mat during dewatering. Its high specific surface impedes consolidation of solids in the clarifier. Fines are generated in the TMP refining process and build up because of low first-pass retention on the newsprint machine. One large source of fines is the discharge of fourth-stage cleaner rejects. Another source is press pan effluent.

Solids in the primary clarifier underflow are poorly consolidated because the TMP process produces highly refined fibers that are saturated with water and have a very low settling velocity. Therefore, gravity clarification, while effective in providing suitable quality overflow, provides low-solids underflow. Gravitational forces are inadequate to force water from between sludge particles.

The high solids content of the raw wastewater causes a hindered settling condition in the clarifier. The clarifier acts more as a thickener because the raw wastewater

TABLE 1: **Summary of thickening performance results**

Method	Thickened sludge solids[1]	Polymer dose	Capture (%)
Hydrasieve	2.6%	16.5 lb/ton[2]	86
Centrifuge	4%-7%	8.8 lb/ton	93
Rotary screen thickener[3]	2%-3%	6.6-13.2 lb/ton	98
Dissolved air flotation	2%-3%	4.4 lb/ton	N.a.

Notes:
1. Sludge feed varied from 0.8% to 1.1% solids
2. Rough estimate
3. Estimated from bench scale tests
N.a. Not available

Mr. Hewitt is environmental engineer, J.E. Sirrine Co., Research Triangle Park, N.C., and Mr. Ellis is engineering superintendent, Bear Island Paper Co., Doswell, Va.

contains 2000 to 4500 mg/l total suspended solids (TSS) on the average. The mill's primary clarifier is loaded at less than 300 gal/day/ft^2, which is about half the typical design value for kraft wastewater primary clarifiers.

The low solids content in the primary clarifier underflow makes the sludge more difficult to dewater, and additional sludge dewatering equipment is needed. During the equipment-testing period, the underflow solids ranged from 0.8% to 1.2% solids. Since that time, operating experience, clarifier modifications, and polymer addition have allowed improvement in underflow solids to between 1.5% and 2.0%. This is still notably lower than the range of 2.5% to 5.0% solids obtained from kraft wastewater primary clarifiers.

Another unusual feature of TMP sludge is its high organic content. Since pulping chemicals and fillers are not used at this mill, the sludge solids are about 92% volatile. The high organic content suggests high energy content, and the average of samples taken on five consecutive days showed a Btu content of 9227/lb of dry sludge.

Due to high energy and low ash content of the sludge, burning dewatered sludge in the hog fuel boiler was established as the desired disposal option. Analysis of the sludge ash by the Environmental Protection Agency toxicity procedure indicated that the ash is nonhazardous.

The primary TMP sludge is similar in nature to waste biological sludge, particularly in the dilute 1%- to 2%-solids condition. The treatment plant's waste biological sludge amounts to only about 10% of total solids, and no method for easily controlling the mixture of the two was available, so only primary sludge was used in all tests. The expectation was that the small quantity of biological sludge and its similarity in nature to TMP sludge would result in minimal impact on equipment performance.

Thickening tests

Because the primary clarifier underflow solids content was very low and the nature of the sludge made it difficult to dewater, thickening the sludge prior to dewatering was thought to be important. Four methods of thickening were tested: Hydrasieve, centrifuge, rotary screen thickener, and dissolved air flotation (DAF). Table 1 summarizes the performance of each thickening process.

Hydrasieve tests were made on a full-size (6-ft-wide) unit installed ahead of one of the existing belt presses. The unit was loaded at approximately 340 gpm with polymer-conditioned sludge. Precise determination of the polymer dosage could not be made, but it was estimated at about 15 lb/ton of dry solids. The polymer dosage was set so that large flocs formed in the headbox and clumps of thickened sludge rolled off of the base of the screen.

The Hydrasieve provides acceptable thickening for extremely low installed and maintenance costs, but with a high polymer requirement. An advantage of the Hydrasieve is that it can easily be mounted to feed dewatering equipment directly, thus eliminating the need to repump thickened sludge and add more polymer.

The centrifuge tests were made on production-size, solid-bowl-type centrifuges of both high- and low-speed design. The capture rate of the centrifuge was greatly affected by polymer dosage. Capture ranged from 80% at 4.5 lb/ton of polymer to 99% at 10 lb/ton. Cake solids content was not affected much by polymer dosage. The optimum operating condition was determined to be about 7 lb/ton of polymer, where a capture rate of about 85% was obtained. Cake solids can be controlled in the range of 4% to 7% by varying the bowl speed and pond depth.

Bench scale screen tests indicated that the rotary screen thickener would require 6 to 12 lb/ton of polymer to produce thickened sludge at 2% to 3% solids. Full-scale testing apparatus was not available for this equipment, so performance could not be confirmed.

Of the four thickening methods tested, only DAF provided no significant advantage over existing methods. On-site pilot testing showed that sludge could be thickened from 0.8% solids to 2.1% solids using DAF. The DAF system manufacturer indicated that the process could reach 3% solids in full-scale generation by using the skimmer mechanism (not included in pilot test) to optimize the system. The DAF unit manufacturer also tested the unit on raw wastewater to assess its suitability for primary solids removal. The conclusion was that DAF required polymer addition to obtain roughly the same results as gravity clarification without polymer.

Dewatering tests

Dewatering tests were performed on both thickened and unthickened sludge, as appropriate, to determine the maximum obtainable solids content. Five types of equipment were tested: vacuum filter, centrifuge, belt-filter press, diaphragm press, and V-press. The predicted opti-

TABLE 2: **Summary of pilot test results**

Equipment	Sludge	Maximum cake solids
Vacuum filter	Unthickened	22%
Centrifuge	Unthickened	19%
Belt filter press	Unthickened	36%
Diaphragm press	Unthickened	45%
Diaphragm press	Thickened	47%
V-press	Dewatered	33%

TABLE 3: **Dewatering system cost summary**

Combination	Hydrasieve/ belt filter press	Hydrasieve/ belt filter press and V-press	Centrifuge/ belt filter press	Centrifuge/ diaphragm press
Installed cost	$4,150,000	$4,850,000	$5,800,000	$10,000,000
Annual costs				
Power	18,000	54,000	105,000	104,000
Polymer	463,000	463,000	216,000	216,000
Maintenance	55,000	64,000	88,000	265,000
Operating labor	150,000	150,000	150,000	227,000
Ash disposal	17,000	17,000	17,000	17,000
Sludge fuel credit	(366,000)	(389,000)	(366,000)	(437,000)
Total annual cost	**$ 337,000**	**$ 359,000**	**$ 210,000**	**$ 392,000**

Notes:

1. Installed cost includes equipment for conveying dewatered sludge to boiler area and feeding it to boiler. Operating costs are also included.
2. All costs are escalated to 1982 dollars from 1980 dollars using a 10%/yr escalation factor.
3. Total annual costs do not include depreciation or amortization of equipment.

mum dewatering performance of each piece of equipment is summarized in Table 2.

The important factor in selecting dewatering equipment is how economically it can be applied. Equipment manufacturers determine the performance level and operating parameters that, in turn, determine equipment sizing. The results of this evaluation and manufacturers' expected operating performance conditions are discussed below. Performance and application data were used in the economic analysis of the equipment.

Vacuum filter. The cake formed in the vacuum filter leaf tests proved to be too thin for vacuum filtration to be applicable to TMP sludge. Cakes on the order of $\frac{1}{16}$-in. thick were formed, and the manufacturer indicated that this cake would not discharge from the filter media. The apparent problem was that fines in the sludge packed too tightly to allow the vacuum to draw additional solids to the filter cloth.

Centrifuge. Dewatering tests were performed on both high- and low-speed design solid-bowl centrifuges. In the high-speed tests, dewatered sludge in the range of 16% to 19% solids was obtained using 15 to 28 lb/ton of polymer. Less than 60% capture was achieved in these test runs. Sludge cakes of 10% to 12% solids could be achieved using 8 to 12 lb/ton of polymer and obtaining 90% capture. This was deemed to be the optimum operating conditions by the centrifuge manufacturer.

In the low-speed centrifuge tests, dewatered sludge of 10% solids was obtained using 13 lb/ton of polymer; capture rate was 95%+. Experience shows that minimum solids content for TMP sludge to be truckable is 10%.

Belt filter press. A belt-filter press 1.6 ft wide was tested using unthickened primary sludge at 0.9% to 1.3% solids. The configuration found to be most applicable was three S-rolls followed by one nip roll. In the tests, a maximum of 36%-solids cake was obtained, with 7.4 lb/ton polymer and 95% capture. At maximum throughput, the belt press produced 30.6% solids with 9.3 lb/ton polymer and 90% capture.

To determine the effectiveness of the nip roll, the belt press was tested without it. Three test runs in this configuration produced 21% solids.

Thickened sludge was not available for these tests, so machine performance could not be determined. Basically, with thicker feed, the belt press can be expected to operate at higher solids throughput and produce slightly drier cake, with less polymer consumption.

Diaphragm press. The diaphragm press was tested with both thickened and unthickened sludge, and conditioned with either polymer or ferric chloride and lime. Generally, tests produced greater than 40%-solids cake, and no cake discharge or cloth blinding difficulties occurred during the tests. Tests with unthickened sludge basically confirmed that the yield (dry solids/filter area/hour) provided when feeding unthickened sludge was too low for economical operation. The maximum yield obtained by feeding 1.5% or less solids was 0.6 lb/ft^2/hour, for which 43% solids was obtained.

More economical yields and similar solids contents were obtained by feeding thickened sludge. Feeding the discharge from a centrifuge at 3.4% to 4.0% solids, and without additional chemical dosage, provided yields of 0.7 to 1.0 lb/ft^2/hour and sludge cakes of 41% to 46% solids. Using 9 lb/ton of additional polymer raised the average yield to 1.0 lb/ft^2/hour and the solids content to 43% to 44%.

Conditioning with ferric chloride and lime, as opposed to additional polymer, caused similar improvements in yield with slightly higher cake solids.

Although feed consistency was important in the lower ranges, the tests show that there was little difference in yield when feed solids were between 4% and 7%. Also, thicker feed to the press did not necessarily provide a drier cake. From this it was concluded that thickening beyond 4% solids provides no particular advantage.

V-press. A production model V-press was tested on several types of dewatered sludge to determine its ability as a secondary dewatering device. In application, the V-press would serve to increase the dryness of dewatered sludge by several points and to back up the dewatering equipment when poor cake solids are being produced. Two conditions were tested:

- Wet sludge in the 10% to 12% solids range
- Moderate sludge in the 20% to 30% solids range.

In tests with wet sludge, the V-press was incapable of improving cake solids without the use of a sweetener. The fine solids extruded through the screen when feed was at 10% to 12% solids. Using bark fines as a sweetener, the sludge solids (corrected for initial bark moisture) could be raised as high as 32%. This required 50% bark by weight (dry basis).

In tests with moderately dewatered sludge, the V-press was able to improve solids content by three to nine percentage points. The ability of the press to improve dryness decreased with increasing feed cake dryness. In a test with 30%-solids cake from a belt press, the V-press produced a 33%-solids cake.

Conclusions from testing

Thickening. By inspection, it is apparent that the Hydrasieve method of thickening TMP sludge is most applicable for thickening to the 2.5%-solids range. The low capture rate caused some concern, but long-term operation by Bear Island has shown that an anticipated fines buildup has not occurred. In fact, polymer carryback to the primary clarifier with the filtrate is an effective means of polymer addition to the raw wastewater. The centrifuge proved an effective, though capital-intensive, method of thickening sludge to 4% to 7% solids. Capture rates were reasonable, as were polymer requirements.

Dewatering. Centrifuges, belt-filter presses, diaphragm presses, and V-presses are all feasible devices for dewatering TMP sludge. The 10%- to 12%-solids cake provided by centrifuges, although truckable, is so wet that most state

TABLE 4: **Equipment performance and operating parameters for TMP sludge**

	Feed solids	Cake solids	Polymer dose	Design feed rate
Hydrasieve	1.0%	2.5%	10-15 lb/ton[1]	340 gpm/unit
Centrifuge	1.0%	4.0%+	7 lb/ton	250 gpm/unit
Belt filter press	2.5%	30.0%	None	90 gpm/unit
	4.0%	30.0%	None	90 gpm/unit
Diaphragm press	4.0%	42.0%	None	9.9 lb/hr/ft^2

1. Estimated from polymer purchase records
2. Feed from hydrasieve

regulatory agencies will not allow it to be landfilled. Vacuum filters are not feasible for use in dewatering TMP sludge. Therefore, the only good methods for dewatering TMP sludge are belt filters or diaphragm presses.

Economic analysis of methods

A V-press is fairly effective in improving poorly dewatered sludge to a higher solids content, using bark fines as a sweetener when necessary. A V-press is also capable of improving belt-press cake solids content by about three percentage points. The relative value of this is discussed in the following economic analysis.

An analysis was made to determine how to dispose of the sludge most economically. Three methods were considered: landfilling, burning, and land application.

In Bear Island's case, landfilling was very costly at $14/wet ton. Since landfill space is short in the area, other more economical disposal methods were pursued.

TMP sludge, dewatered enough to be spread on land in cake form, is also dry enough to burn. Therefore, only the injection method of land application using thickened (but not dewatered) sludge was considered. The analysis showed that adequate farm acreage close enough to the mill for economical operation was not available. Therefore, burning dewatered sludge was selected as the best alternative to landfilling.

Several promising combinations of thickening/dewatering were developed for consideration based on the technical conclusions from pilot tests. Hydrasieves and centrifuges were considered for thickening; and belt filter presses, diaphragm presses, and V-presses, for dewatering. Table 3 shows combinations selected for analysis.

Capital costs for a system with a capacity of 35 tpd (dry basis) of 1%-solids sludge were determined. In this analysis, performance conditions and loading rates for the equipment are those determined by tests and guaranteed by the manufacturer where possible (Table 4).

For each of the four combinations, capital costs were estimated for installation at Bear Island's facilities. Annual operating costs were developed, based on Bear Island's polymer, power, labor, and ash disposal costs. Since the solids content of the sludge that is to be burned is important, a determination of the annual fuel savings from burning sludge at various solids contents was developed. These costs and savings form the basis of the analysis, and are presented in Table 3.

The cost summary shows that combination No. 1, Hydrasieve thickening and belt filter press dewatering, is more economical than Nos. 2 and 4. No. 3, with a lower annual cost but higher installed cost than No. 1, is less economical than No. 1 by most analysis methods.

Combination	Initial cost	Annual cost
No. 1	$4,150,000	$337,000
No. 3	$5,800,000	$210,000
Difference	($1,650,000)	$127,000

Saving $127,000/year by investing $1,650,000 yields a first-year return of 8%, which was not attractive to Bear Island. Therefore, thickening by Hydrasieve and dewatering by belt press was selected by the mill.

The question of whether the additional three percentage points obtained using a V-press after the belt press is attractive can be answered by comparing combinations Nos. 1 and 2. The drier sludge from the V-press increased the sludge fuel credit by $33,000/year but power and maintenance costs for the V-press more than offset the increased credit.

A closer look at the cost data shows two significant sensitivities of this analysis. The greatest sensitivity is polymer cost. Using a centrifuge can cut polymer use by more than half. The polymer found to be most effective in all tests run on TMP sludge was a cationic polymer with medium charge density, costing $2.10/lb at test time. If polymer costs rose rapidly, centrifuge thickening would be more attractive. The other sensitivity is the sludge fuel credit. Rapidly rising fuel prices would make drier sludge more attractive. Conversely, inability to burn sludge would eliminate the credit and replace it with a landfilling or land spreading cost. Here, sludge density (weight dry solid/volume) would become important.

Operating experience

The selected sludge dewatering system has been operating since July 1981. Actual operations reveal a much higher solids loading than predicted in the of 100% TMP mill design. The solids were found to be very hard to dewater. As a result, additional solids handling equipment was needed. It was found that settling and underflow conditions were improved by maintaining a pH of 9.0 to 9.5 in the primary clarifier feed, adding residual polymer from the press effluent, and slowing down the clarifier rake speed by approximately 60%, to a tip speed of 10 fpm. The higher pH, polymer feed, and slower rake speed increased underflow solids from 0.8% to 1.2% up to 1.5% to 2.0%. Maintaining uniform underflow concentrations remains difficult due to varying conditions in the mill. Sludge storage tanks with mixing equipment dampen the effect of changes in sludge solids content as fed to the dewatering equipment. Increased retention in the primary clarifier has not helped to thicken the underflow.

Variation in sludge consistency requires continuous monitoring of the polymer dosage, which ranges from 10 to 20 lb/ton of dewatered sludge. Based on the tests run during the study period and information from the mill's operations, a Hydrasieve was chosen as the best means to thicken the sludge prior to dewatering on the belt filter presses. The polymer solution is added ahead of the Hydrasieve just prior to a static inline mixer. Flocculation occurs in the gently mixed headbox of the Hydrasieve.

Hydrasieve filtrate is returned to the primary clarifier carrying residual polymer to the clarifier, aiding in settling. Thickened sludge falls from the Hydrasieve directly to the press headbox and is dewatered to a cake of 25% to 33% solids at a rate of 20 to 26 tpd. The belt filter press has the capability of producing a drier filter cake by increasing nip pressure. But, fines in the sludge soon clog the belts, and belt-cleaning showers are no longer effective. This clogging effect limits overall cake dryness.

The cake sludge has a fuel value if cake solids are maintained above 25%. Presently a portion of the sludge cake is mixed with bark and blown to the hog fuel boiler as fuel. Additional equipment (presses, dryers) following existing belt filter presses is being considered to dry the cake to 35% to 45% solids, which will allow direct firing in the boiler and minimize cake handling needs. Experience shows that dewatering equipment for TMP sludge must be heavy-duty in design and highly corrosion resistant. Maintenance-free operation/reliability are as important, particularly when sludge burning is practiced. □

Dry forming establishing itself as commercial process—still problems

Advanced forming and bonding technology, absorbents, and the emerging market for adult incontinent products featured at fall Insight 82 conference

By WILLARD E. MIES, News & Business Editor

☐ Dry forming is establishing itself as a commercial process for making disposable absorbent products, but progress has been gradual and some problems remain.

The attractions of the technology—depositing fibers on a moving screen without the use of water—are still there. These include lower capital and energy costs than conventional wet forming, almost no pollution, flexibility to site plants near urban markets and, perhaps most important of all, the potential to make a variety of new products offering superior performance.

But holding back the process have been high raw material costs (due to the need for expensive binder to hold the fibers together), low machine speeds and efficiencies, a lack of available operating know-how and a complex tangle of litigation involving equipment suppliers and paper companies—although most of the latter has been now resolved.

The current state of dry forming technology was one subject discussed at the Insight 82 conferences sponsored by Marketing/Technology Service Inc. last October at the Marriott Hilton Head Resort on Hilton Head Island, S.C. The conferences—covering advanced forming/bonding, absorbent products, and adult incontinent products—attracted over 300 attendees from about 20 countries and featured a wide array of new product samples.

Current state of dry forming technology

The present stage of Kroyer dry forming was described by **Henning Skov Jensen**, sales manager, and **Sven G. Agren**, senior vice-president/consultant, for Moller & Jochumsen A/S (M&J Paper Div.), which has worldwide rights to market, license, and sell Kroyer plants. Seven companies in various parts of the world are currently operating commercial Kroyer plants, and about 20 more have installations under study, they said.

Kroyer dry forming plants can be supplied in a variety of configurations and sizes, ranging from "miniformers" of only 4 kg/hour (8.8 lb/hour) capacity up to commercial-scale installations ranging from 0.5 to 3 metric tons/hour, with a trimmed width up to 3.0 meters (118 in.). Equipment can be supplied to defibrate roll pulp, bale pulp, and secondary fibers.

The patented Kroyer integrated "sixer" forming head distributes fiber through a horizontal screen mounted parallel to the forming wire so that fibers fall an equal distance. This provides better control of the forming process and gives a machine-direction/cross-direction (MD/CD) profile of ±2%, according to Jensen.

There are various alternatives for bonding dry formed products. A typical machine layout might include pattern embossing/spraying of binder on one side of the web/flatbed through-drying/spraying of binder on the other side/flatbed through-drying and curing/product cooling and humidifying/and finally reeling. In another arrangement, pattern embossing might be followed by two-sided foam impregnation of binder and then drum-drying and curing in one operation.

Capital cost for a turnkey dry forming installation is only about 40% of that required for wet forming, Jensen said. Estimated capital cost of installing a 3 metric ton/hour, or 23,000-tpy, machine with a 3.0-m trim is about $11.5 million, of which about $8.2 million would be for machinery and equipment, he said. This works out to an investment per annual ton of only $500, vs $1300 for a 6 ton/hour, or 45,000-tpy, wet forming installation where the total investment would be at least $60 million.

Production costs compared to wet forming

Agren compared production costs per annual ton for three different size dry forming machines with those of the 6 ton/hour wet forming installation. A smaller 1 metric ton/hour machine would have higher production costs, while those of a 2 ton/hour machine would be about the same, and those for a large 3 ton/hour machine would be roughly 10% lower (see Table 2).

Depreciation and interest costs would be significantly lower because of the smaller capital investment involved, while energy costs would be about two thirds those of the wet forming unit. Power consumption was estimated at between 675 to 800 kwh/metric ton of trimmed products on the reel. Raw material costs for the dry forming installation, however, are higher because binder is about three times as expensive as pulp.

The product used in this estimate is a roll towel with a 10% latex content. Other dry formed products might require 20% or more binder, but their unique quality should command a higher price, Agren said. Dry forming capacity has mainly been applied to products where high softness, bulk, and absorption are important.

Lesson of a troublesome startup

Not all problems with dry forming have been worked out, however, according to **Dr. D. Milesi**, general manager of N.I.AV. SpA, who described the "lesson of a troublesome startup." N.I.AV. (Nuove Iniziative Avigliano) was created by a government financial agency to replace an idle corrugating medium mill in Avigliano, a small town in the Lucania region of southern Italy.

A 3-m-wide machine with a design capacity of more than 1 metric ton/hour was ordered and the plant began operation in September 1981. Startup of the plant proved to be more difficult than anticipated, with one factor being a worldwide lack of available operating know-how—"the knowledge of a whole sequence of operating tricks and of small gadgets which allow production with good efficiencies and which can only be acquired through long operating experience."

Such knowledge is now gradually being acquired, Milesi said, and N.I.AV. has been able to produce commercial quantities of material for kitchen roll towels (60 g/m^2, or 37 lb/3000 ft^2), industrial wipes (90 g/m^2, or 55 lb) and hospital bed sheets (60 to 70 g/m^2, or 31 to 37 lb). Production costs so far are ranging from 20% to 60% over those producing wet-laid tissue.

Nevertheless, Milesi believes that dry formed products will eventually capture a major share of the market

Update on commercial dry forming activities

U.S. companies that have recently been using dry forming to make absorbent disposable products have been Scott Paper Co., Johnson & Johnson Co., James River Corp., Fort Howard Paper Co., and Kimberly-Clark Corp. (see Table 1). The most successful commercial products appear to be consumer and industrial wipes, medical and health care products, and (to a lesser extent) kitchen roll towels.

K-C about two years ago began producing Softique facial tissue on an air forming line at its New Milford, Conn., mill, but now appears to be favoring a wet-formed version of this product, according to industry observers. The dry forming line is reportedly idle, but the company is said to be investigating other products for the installation. These would probably be bulkier than its facial tissue, which had a basis weight of only 30 g/m^2 (18 lb/3000 ft^2).

In a similar move several years ago, Scott Paper phased out an air-laid version of its Job Squad kitchen roll towel in favor of a wet-laid product, and is now concentrating on air-laid production of baby wipes and other products at its Dover, Del., plant, However, James River, which last year acquired the Dixie-Northern assets of American Can Co., is still producing Bolt kitchen towels, but is also expanding air forming at its Green Bay, Wis., mill into industrial wipes and medical products.

The extent of commitment required for commercializing the new technology was recently revealed by James River, which told security analysts that its air forming operation is now at the breakeven level after losses of $14 to $15 million a year ago, and as high as $24 million two years ago.

In Europe, there have been at least four new dry forming installations in the past couple of years. Vereinigte Papierwerke Schickedanz is test marketing a roll towel called Quilt in Fed. Rep. of Germany, produced on a Kroyer dry forming line in Nürnberg. N.I.AV. is air forming web for kitchen towels, industrial wipes and hospital bed sheets in southern Italy (see accompanying story). And Beghin-Say has installed an air-laid machine in France which may start up this year pending resolution of certain legal issues, according to industry observers.

Meanwhile, United Paper Mills of Finland and Dan-Webforming International have installed a joint-venture machine at the latter's facility in Aarhus, Denmark. The 1.8-m-wire-width drum-former machine has a design speed of 300 m/min and a capacity of 500 kg/hour (or about 12 metric tpd). Most startup problems have been overcome and the Uni-Web machine has been producing material for tablecloths, napkins, and roll towels. Plans are to double capacity of the line to 1000 kg/hour later this year (see article on p. 117). Dan-Web also claims to have an order for another new, more than 2.5-m-width dry forming machine to be installed in Europe this year.

Dry forming has already had a major commercial impact in the production of hardboard and medium-density fiberboard. Motala-Defibrator claims about 15 installations worldwide, including installations at Georgia-Pacific Corp., Holly Hill, S.C., and Louisiana-Pacific Corp., Eufala, Ala.

TABLE 1: **Commercial dry forming installations for absorbent products, based mainly on woodpulp**

Company	**Location**	**Products**
Scott Paper	Dover, Del.[1]	Baby Fresh wipes, industrial, wipes
Johnson & Johnson	Illinois/New Jersey[2]	Baby wipes, medical products*
James River (Dixie/Northern)	Green Bay, Wis.[3]	Bolt towels, industrial wipes, medical products
Fort Howard	Green Bay, Wis.[3]	Shur Wipe industrial wipes
Kimberly-Clark	New Milford, Conn.[3]	Softique facial tissue†
Honshu Paper	Fuji City, Japan[4]	Cigarette filter paper, towels, wipes
N.I.AV.	Avigliano, Italy[3]	Kitchen towels, industrial wipes, hospital bedsheets
Béghin-Say	France[3]	n.a.‡
Vereinigte Papierwerke Schickedanz	Nürnberg, W. Germany[3]	Quilt kitchen towels
United Paper Mills Dan-Webforming (Uni-Web)	Aarhus, Denmark[5]	Tablecloths, napkins, roll towels

Equipment/process: [1]Scott/Rando [2]Johnson & Johnson/Honshu [3]Kroyer [4]Honshu [5]Dan-Webforming (Scan-Web). Most original equipment supplied by machinery manufacturers has been modified in varying degree by absorbent product producers.

*No longer producing diaper facing. †Machine believed to be temporarily idle. ‡Awaiting startup.

Source: P&P estimates.

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for absorbent disposable products if manufacturing costs for the still-embryonic process can be lowered. This is because dry formed products, with their "limited reusability," fill a unique niche between more expensive durable wovens/nonwovens and cheaper nondurable wet formed tissue products, he said.

Dry forming production costs are not competitive because of high raw material costs and low machine speeds and efficiency, Milesi noted. Raw materials, which account for 60% to 75% of total manufacturing costs, are 20% to 40% higher than for wet forming, he said. Such costs could be reduced through optimization of binder use, development of a defibration system to use bale pulp rather than more expensive roll pulp, and the ability to recycle scrap containing binder back into the system.

Along with improved dryer fuel efficiency and lower electrical energy consumption, such improvements in the process would permit the manufacturer of superior quality products at a cost between 10% and 20% higher than the best quality wet-process products—resulting in prices that would be acceptable to a large segment of the market, Milesi believes. Manufacturers must develop more efficient second- and third-generation machines, he added, with speeds up to 500 m/min (1650 fpm)—a big jump over current levels.

James River experience with air-forming

A description of James River Corp.'s Airtex line and its capabilities was provided by **Michael P. Bouchette**, senior supervisor for air-forming product development.

Pulp in either roll or bale form is defibered by means of hammermilling, and then the fibers are transported to the forming section. Airflow and rotating paddles keep the fibers in a state of random agitation in the forming heads until gravity and applied vacuum cause them to deposit through a sifting screen onto the moving forming wire. Successive multiple forming heads are used to accomplish a gradual buildup of fiber, thereby increasing the web or fabric thickness. Once completely built up and formed, the web is transferred to the bonding section where it is spray-bonded with latex—first one side, and then the other—and then dried and cured.

Every step of the process lends itself to flexibility and the development of new products with unique attributes, according to Bouchette. These include use of varied pulp layers, different bonding latexes, various surface finishing treatments, different basis weights (from 30 lb to 65 lb/3000 ft^2), varying bulks and tensile strength. Webs can be produced with MD/CD tensile ratios as low as 1.25:1. Other options include color and varying degrees of compaction, calendering, and embossing.

Airtex nonwoven roll material has been used in such medical/health care products as surgeon's handtowels, incontinent pads, medical washcloths, and prep pads, and in such commercial and industrial products as baby wipes, premoistened towelettes, industrial shop wipes, and food service wipes.

A different area in which dry forming is already a firmly established commercial process is in the production of hardboard and medium-density fiberboard. An update on the Pendistor forming station was provided by **Peter H. Wiecke** of Sunds Defibrator, which has supplied lines to 15 customers since 1977.

Woodchips are fed through a pressurized refiner and the fiber is covered with resin (usually urea formaldehyde) prior to forming. The Pendistor forming head lays down a mat with a bulk density of 2 to 3 lb/ft^2 (32 to 48 kg/m^2) at a speed of 15 to 120 fpm (5 to 37 m/min). The fiber mats are then precompressed, trimmed in length and width, and inserted in a hot press where they are pressed into boards under pressure and heat.

TABLE 2: **Comparative costs for producing towels on Kroyer dry-forming units vs conventional wet forming machine**

	($/metric ton)			
Capacity	——— **Dry forming**		———	**Wet**
Ton/hour	1	2	3	6
Ton/year	7000	15,000	23,000	45,000
Cost				
Energy	65	55	50	85
Manpower/+admin.	180	85	55	45
Interest	55	30	25	65
Depreciation	110	60	50	130
Subtotal	410	230	180	325
Raw material	720	720	720	650
Total	**1130**	**950**	**900**	**975**

Source: Moller & Jochumsen (M&J Paper Div.) Insight 82 conference.

New method for tissue moisture profile control

Sam Palazzolo, senior product line engineer for Beloit Corp., discussed the application of induction heating to improve moisture profile correction on high speed, wide, single-felt tissue machines.

This can be done by installing an electromagnet near the outside surface of the dryer. When the magnet is energized, there is an electromagnetic field that intersects the portion of the dryer shell adjacent to the magnet. When the dryer surface is moving, the magnetic field produces currents in the dryer shell which in turn heat the shell surface.

A single row of d.c. inductors, installed along a line parallel to the roll axis and near the shell surface, is sufficient to adequately correct moisture profile on most tissue grades, he said. The maximum correction range depends on the characteristics of the magnets, the power level, the clerance gap, and the dryer speed.

The first such d.c. experimental moisture profile corrector was installed by Beloit on a machine in Holland on which moisture previously varied from a low of 5.9% to a maximum of 9.0%. After installation, the moisture profile was leveled to within ±0.1% at the same average moisture content of 8%. Actual average moisture levels at the reel were eventually raised from 4.5% to a level of 7%, resulting in an energy savings and permitting a 500 fpm increase in machine speed.

A second profiler was installed on a 5-m (16.4-ft) wide tissue machine in West Germany. Moisture profile variation was reduced from 5% to 2.2%, enabling an increase in machine speed from 4750 to 5400 fpm. The German mill also noted a reduction in energy consumption as moisture content was raised by 2% and both mills reported improved uniformity on the shell coating of their Yankee dryers.

Outlook: lightweight, thermally bonded nonwovens

In the U.S., the production of thermally bonded, lightweight, staple-based nonwoven fabrics is still small

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TABLE 3: **U.S. cover stock market, 1982**

(Millions of lb)	
By end-use	
Disposable baby diapers	135
Sanitary napkins, underpads, adult diapers, other	30
Total	**165**
By process	
Bonded staple	110
Spunbonded	53
Other	2
Total	**165**

Source: John R. Starr estimates.

and limited to specialty materials such as high-performance wipers, insulation, battery separators and a few other technical products, according to management consultant **John R. Starr** of Boston.

However, most major U.S. suppliers of lightweight staple fiber nonwovens are engaged in development programs to commercialize thermally bonded fabrics in large volume applications such as coverstock for disposable diapers, sanitary, and medical products. In Western Europe, thermally bonded lightweight staple nonwovens are already established in these large-volume coverstock markets, and consumption is growing.

The reasons for the interest in thermally bonded lightweight materials include a number of performance factors such as improved softness over resin-bonded materials, elimination of chemical binders, and the possibility of lower cost over resin-bonded fabrics in some cases, according to Starr.

The lightweight carded nonwoven business is in a mature stage of development, with growth rate for bonded carded staple nonwovens in the U.S. in lightweight disposable end uses expected to grow 5%/year through 1987 (from 200 million lb to 255 million lb). This is slightly below the 8%/year unit volume growth forecast for the entire U.S. lightweight disposable nonwoven sector (from 490 million lb to 730 million lb).

Nevertheless, the market potential for lightweight, thermally bonded carded fabrics is considerable. Although mature, the lightweight carded fabrics business still represents the single largest volume sector of the nonwovens fabrics industry in the U.S. and Western Europe. Thermally bonded fabrics can probably replace most conventional resin-bonded materials and capture a major portion of the coverstock market in both regions.

Although there are other end-use markets, coverstock will be by far the largest volume use for lightweight, thermally bonded fabrics. Total U.S. coverstock shipments in 1982 are estimated at 165 million lb, of which bonded staple represents 110 million lb, or 65% (Table 3). Baby diaper coverstock represents 135 million lb, or 82% of all coverstock consumption. Western European coverstock output in 1982 is estimated at 130 million lb.

Spunbonded to increase coverstock market share

Spunbonded is expected to continue to increase its share of both the U.S. and European coverstock markets during the next five years, while bonded staple fabrics lose share but still grow in total pounds. Manufacturing costs by 1987 for lightweight spunbonded polypropylene are forecast to be 15% to 20% lower than for carded, thermally bonded polypropylene staple fabric.

However, lightweight, thermally bonded staple fabrics are being produced in pilot quantities that are superior in softness to resin bonded and spunbonded fabrics now commercially available in the U.S. Thus, they will probably find initial use in premium priced disposable baby diapers, sanitary napkins, and similar products.

Richard G. Mansfield, president of R.G. Mansfield & Associates, agreed that the use of thermal bonding is growing as a wider range of thermoplastic and specialized bicomponent fibers has become available. Also helping is development of new thermal bonding equipment, such as calenders and heated air systems, and more precise solid-state electronic controls for temperature.

Ultrasonic bonding is a newer form of thermal bonding that is now being practiced commercially and has good potential for future growth. Kimberly-Clark Corp. has several patents in this area, one of which discloses use of sonic bonding in combination with stretching to produce an apertured structure. Several firms are now reported to be working on laser bonding systems for nonwovens, Mansfield said.

Meanwhile, the growing interest in thermal bonding is causing resin binder producers to try to upgrade their products. Much of this effort on resin binders is directed toward elimination of formaldehyde and the reduction of temperatures required for curing.

Major growth seen for adult diapers

A major new market for fluff pulp, superabsorbents, and lightweight nonwoven coverstock is expected to be in adult diapers. About 3% of males and 8% of women in the U.S. suffer from urinary incontinence, according to two recent studies cited **Beth Gove**, a nurse consultant for M/TS—or at least 8 million people, especially the elderly, according to **Charles A. Stocking**, executive vice-president of Principle Business Enterprises Inc., a supplier of adult diapers.

However, most adult diapers currently on the market are poorly designed and are little more than scaled-up baby diapers, according to **James P. Hanson**, director of M/TS, who recently completed a major testing evaluation of products currently available. High costs to the consumer are another problem, but these should come down as the market expands and competition among producers increases. ☐

Proceedings of papers presented at Insight 82 are available from Marketing/Technology Service Inc., 3125 W. Main St., Kalamazoo, Mich. 49007. The Insight 83 advanced forming/bonding; absorbent products; and adult incontinent products conferences will be held Nov. 13-19 at La Mansion del Rio Hotel, San Antonio, Texas.

M/TS is also holding a series of Focus 83 and Impact 83 conferences this spring at Epcot Center, Lake Buena Vista, Fla., covering twin-wire and new formers (May 8-10); composite and laminated structures (May 8-10); wet end developments (May 11-12); durable nonwovens and specialty markets (May 11-12); and computer opportunities for the nonwoven and paper industries (May 13).

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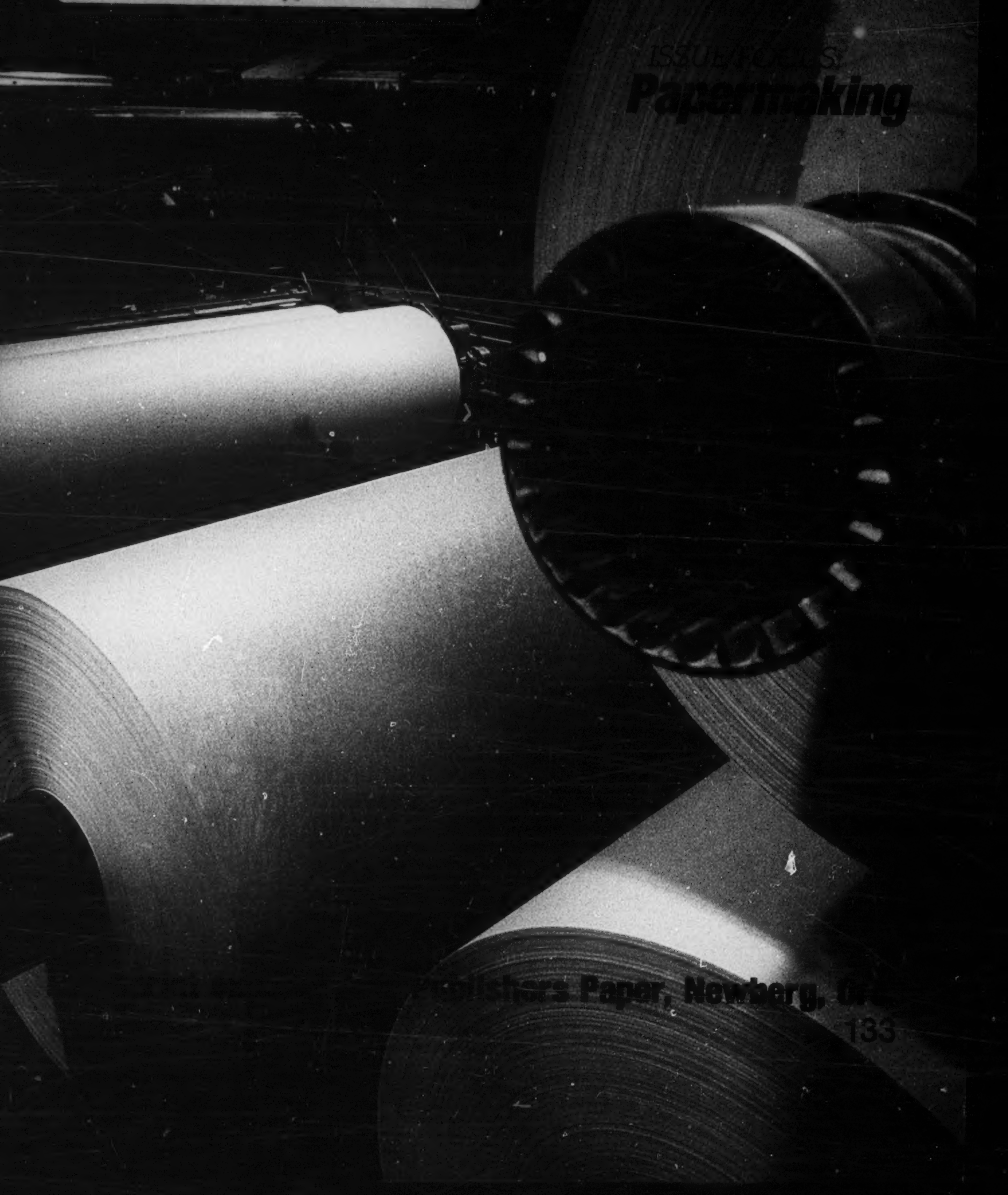

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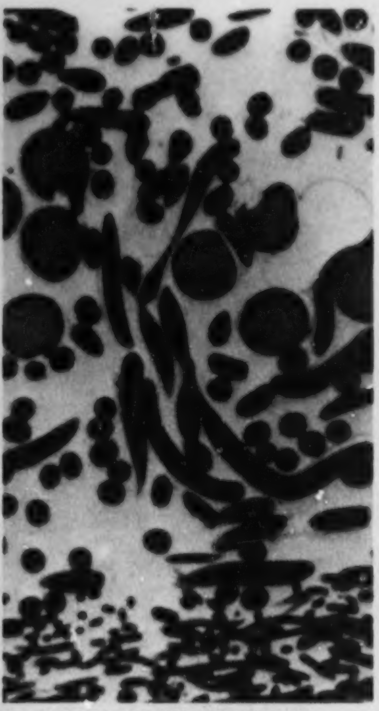

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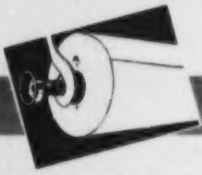

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COVER: *View of the dry end of Publishers Paper's new 210,000-tpy Voith Duoformer C twin-wire newsprint machine, heart of the Newberg, Ore., expansion. (Photo courtesy of Times Mirror.)*

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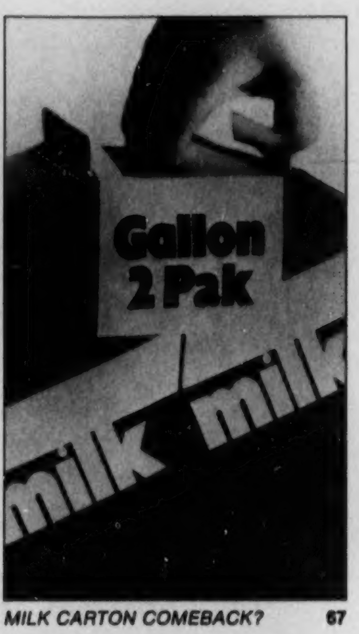

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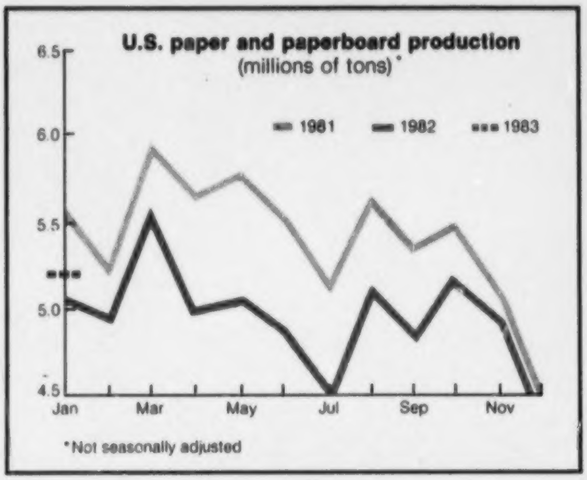
MONTH IN STATISTICS

U.S. paper and paperboard production got off to a brisk start in January, totaling 5.2 million short tons, up 5.3% over the year-ago level, according to the American Paper Institute. The production trend, as measured by the two-month moving average of the seasonally adjusted data, was 61.0 million tpy, about 2% below the record-high average rate attained in 1981.

Among major grades, the strongest gains in paper production were in the printing and tissue sectors. Preliminary data also indicate some recovery in the packaging grades, but lackluster performance for bleached bristols. Paperboard production showed a stronger pattern than paper in January, rising 7.4% from its January 1982 level. Both solid woodpulp and recycled grades shared in this gain, rising 7.3% and 7.7%, respectively, over year-earlier levels. Containerboard production for domestic use rose 7.5% over year ago.

Total Canadian newsprint shipments in January came to 604,000 metric tons, down 9.9% from January 1982, according to the Canadian Pulp & Paper Assn. Newsprint mill operating rates rose to 81% from 71% in December, but were well below the 95% rate of a year earlier.



		Latest month (000 short tons)	% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION[1]					
Newsprint	January	444	−3.1	5,332	−2.9
Uncoated groundwood (s)	January	114	1.8	1,364	1.9
Coated paper (s)	January	427	5.7	5,128	5.7
Uncoated free sheet (s)	January	686	5.5	8,226	5.5
Unbleached kraft packaging and industrial (s)	January	325	3.8	3,900	3.7
Tissue	January	390	8.9	4,680	9.0
Total paper	**January**	**2,623**	**3.3**	**31,475**	**3.4**
Kraft linerboard, unbleached	January	1,202	12.0	14,429	12.0
Semichemical medium	January	383	2.1	4,593	2.2
Bleached paperboard	January	322	4.5	3,869	4.5
Recycled paperboard	January	587	7.7	7,043	7.7
Total paperboard	**January**	**2,575**	**7.4**	**30,905**	**7.4**
Total paper and paperboard*	**January**	**5,198**	**5.3**	**62,380**	**5.3**
PULP, WASTEPAPER & FIBER[2]					
Total woodpulp production	December	3,548	−1.9	49,367	−5.1
Market pulp production	December	378	11.6	5,668	−8.7
Wastepaper consumption at paper/board mills	December	1,025	−7.5	13,525	−2.5
Pulpwood consumption (cords)	January	n.a.		n.a.	
CONVERTED PRODUCTS STATISTICS[3]					
Corrugated box shipments (billion ft^2)	January	19.980	5.7	19.980†	5.7
Containerboard inventories at box plants	Jan. 1	2,590	−1.4		
INTERNATIONAL TRADE[2]					
U.S. paper imports (including products)	December	605	−6.1	8,022	−3.8
Imports of Canadian newsprint	December	498	−10.6	6,485†	−6.5
U.S. paper exports (including products)	December	344	1.8	4,246	−8.5
Exports of unbleached kraft linerboard	January	180	36.4	2,165	36.9
Exports of woodpulp	December	285	−9.5	3,394	−7.7
CANADIAN STATISTICS[4] (reported in metric tons)					
Total newsprint shipments	January	604	−9.9	604†	−9.9
Operating rates	January	81%	95%	81%	95%
Inventories held by U.S. consumers	Jan. 31	1,247	−20.1		
Woodpulp shipments (export only)	January	433	−4.0	433†	−4.0
Operating rates	January	73%	82%	73%	82%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fiber Box Assn., Paperboard Packaging Council. 4. Canadian Pulp & Paper Assn.
*Includes construction and wet machine grades. †Not annualized. ‡Not directly comparable to year ago because of coding change. (s) = shipments.

(Continued from page 31)

Technology Inc. is engineering the project. Earlier, the company indicated it was considering the project due to high energy costs and solid waste disposal problems (P&P, Mar., p. 37).

The boiler is slated to come online late in 1985 and be fully operational by early 1986. Construction is expected to begin this fall, by which time all necessary environmental permits should have been obtained, the company noted.

- **Procter & Gamble Paper Products Co.** plans to spend more than $10 million to install a new energy system at its Green Bay, Wis., tissue mill to burn bark and other solid waste material. When the new system is completed in mid-1983, most incoming pulpwood to the mill will be debarked. The bark will be combined with other solid waste and burned in a fluidized-bed combustion unit to generate heated air for throughdrying.

The process is expected to burn about 250 tpd of bark and 20 tpd of other waste, saving 560 million ft^3/year of gas.

ENVIRONMENT

St. Regis sued over particulates

St. Regis Paper Co. was sued recently by Environmental Protection Agency for $100,000 for alleged violation of federal, state, and regional air quality rules at its 1000-tpd Tacoma, Wash., market kraft pulp mill. The suit, filed in U.S. District Court in Tacoma, claims the mill exceeded particulate standards on four occasions, and asks the court to order the mill to meet appropriate national ambient air quality standards.

EPA claims the Puget Sound Air Pollution Control District detected 18 violations at the mill in 1980 and 1981, and EPA gave the company a notice of violation in July 1981, giving the mill 30 days to meet particulate standards. The current suit claims that on four occasions after that 30-day period—on Nov. 1, 1981, and on May 24, Aug. 25 and Oct. 14, 1982—further violations occurred. A $25,000 fine can be levied for each violation of those standards.

St. Regis would not comment on the suit, although the mill manager said the company has spent $425,000 on equipment to satisfy EPA demands.

PRODUCTION

U.S. paper output off 4.3% in 1982

U.S. paper and paperboard production totaled 59.4 million tons in 1982, 4.3% below the revised 1981 total of 62.1 million tons, according to American Paper Institute statistics. This reflected the overall trend of the economy in which real GNP fell 1.8% and manufacturing production declined 8.6%.

"The trend of paper and paperboard production through 1982 could be likened to a suspension bridge: rising in the first quarter; falling in the second; rising again in the third; and tilting downward again towards the end of the fourth quarter."

Reflecting the large number of mill and machine shutdowns at yearend, the two-month seasonally adjusted moving average for paper/paperboard production dropped below the 60-million-tpy rate in December for the first time since August, API noted. Before the December drop to 59.3 million tpy, production was running about 60.6 million tpy last fall.

U.S. paper and paperboard production

	Production	New Supply†	Ratio new supply/ $ billion real GNP
1982	59,444	62,914	42,640
4th*	59,589	63,599	43,210
3rd*	59,742	62,515	42,210
2nd*	57,852	61,248	41,430
1st*	60,874	64,572	43,910
1981	62,126	65,506	43,600
4th*	59,955	64,300	43,150
3rd*	63,184	65,982	43,690
2nd*	62,429	65,458	43,570
1st*	63,146	66,498	44,100
1980	61,147	64,303	43,620
1979	61,271	66,399	44,880
1978	58,744	64,224	44,640
1977	56,823	60,946	44,500
1976	55,151	58,805	45,300

*Quarterly production, new supply data at seasonally adjusted annual rate.
†Production + imports − exports (export/import data for 1982 estimated).
Source: American Paper Institute.

Among major grades, printing/writing paper production held up fairly well in 1982, with uncoated free-sheet shipments of 7.8 million tons down only 0.8%, and coated paper shipments up 2.9% to 5.0 million tons. Newsprint fell 3.6% to 5.0 million tons, while tissue was off 2.9% at 4.4 million tons.

Packaging grades were hard hit by the sharp downturn in U.S. manufacturing activity. Unbleached kraft linerboard production declined 6.5% to 13.6 million tons, solid bleached board production declined 5.8% to 3.7 million tons, and recycled paperboard dropped 5.8% to 6.6 million tons. Unbleached kraft packaging paper shipments dropped 5.2% to 3.5 million tons.

U.S. imports of paper/paperboard in 1982 (mainly newsprint) were estimated at 7.6 million tons, down 4.1% from 1981 levels, while exports of 4.1 million tons were down 9.1%.

New supply (apparent consumption) of U.S. paper and board for 1982 totaled 62.9 million tons, down 3.9% from 1981. Ratio of new supply per billion dollars of real GNP declined to 42,640 tons in 1982 from 43,600 tons in 1981 and a similar level in 1980, indicating some slight further slippage between paper and the general level of business activity.

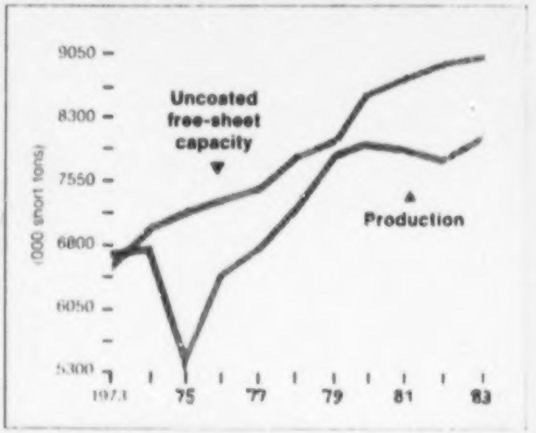
Corrected reprints of bleaching technology review available

The article "Bleaching technology review: recent developments, future trends," which appeared in the October issue of PULP & PAPER (page 61), contained several textual and graphic errors. This five-page article by Martin MacLeod has been corrected and is now available in reprint form. Interested readers should write: Dana M. Baker, PULP & PAPER, 500 Howard St., San Francisco, Calif. 94105.

Uncoated printing/writing papers: Turnaround in progress and record performance possible

Statistics	**1981**	**1982**	**1983e**
Production, 000 tons'	7898	7837	8111
Capacity, 000 tons	8828	8937	9049
Utilization rate, %	89.5	87.7	89.6
Imports, 000 tons	127	169	150
Exports, 000 tor	117	72	80
Apparent U.S. consumption			
000 tons	7908	7934	8181
lb/capita	69.2	68.8	70.2
000 tons/$ billion real GNP	5.26	5.38	5.36

'American Paper Institute data for shipments
e=Pulp & Paper estimate



Estimated capacities of major U.S. companies are:

	Annual capacity (000 tons)	Capacity share (%)
1. Champion International	795	8.8
2. Boise Cascade Corp.	791	8.7
3. Great Northern Nekoosa	700	7.7
4. International Paper Co.	675	7.5
5. Hammermill Paper Co.	633	7.0
6. Union Camp Corp.	490	5.4
7. Georgia-Pacific	464	5.1
8. Weyerhaeuser Co.	450	5.0
9. Mead Corp.	430	4.8
10. P.H Glatfelter Co.	430	4.8
11. Simpson Paper Co.	355	3.9
12. Finch, Pruyn	200	2.2
13. Pentair Inc.	187	2.1
14. Westvaco Corp.	180	2.0
15. Scott Paper Co.	160	1.8
16. Fraser Paper Ltd.	150	1.7

U.S. annual capacity (1983): **9.049 million tons**
Capacity share of top five companies: 39.5%
Capacity share of top ten companies: 64.7%

Grade structure: Papers included in this grade are uncoated and are made with 10% or less mechanical pulp in the furnish. End-uses fall into such general areas as book and other printing paper (including offset, cover, and text); office papers (including forms, copy, tablet, and envelope); and miscellaneous papers (such as technical, papeterie and colored school). Not included are uncoated groundwood, cotton fiber, bristols and thin papers.

Production/capacity: A two-year slump followed 1980's record, and new areas of weakness appeared in 1982. But during the second half, end-uses such as copy paper, forms bond and roll offset printing papers began to recover, with copy paper shipments actually rising 2% in 1982. Shipments to the ailing book industry fell by almost 10%, however.

As result of a 1.2% increase in capacity, operating rates averaged just 88% for the year and only 84% in the third quarter. A further 1.3% rise in capacity is expected by American Paper Institute for 1983—far short of the 3.5%/year pace of the 1970s.

Outlook: Merchant and consumer inventories were at bare bones levels in 1982 and mill order backlogs fell to a week or less in some cases. Going into early 1983, however, consumption began to recover and order backlogs to lengthen. With economic activity turning up, outlook for office grades is for an improvement over 1982 levels ranging from 1% to 6%. The book industry expects little growth, however, dampening prospects somewhat for publishing grades.

Pricing: Prices fell sharply for most grades until late 1982, with customers accepting substitute grades to gain price advantage and some mills offering discounts with apparently little regard for costs, simply to win business. As a result, peak pricing achieved in mid-1981 may not be seen again until late 1983 or early 1984, although competitive discounting was on the wane in early 1983.

Two important grades have been chosen as representative of pricing trends. Prices shown are year-end, $/short ton, list quotes. (The 1982 numbers shown in parentheses are estimated range of transaction quotes. List prices before 1982 considered reliable.)

Book paper, No. 3 offset, 45-lb, sheets—1972, $460; 1974, $535; 1976, $506; 1978, $645; 1980, $813; 1981, $878; 1982, $878 ($580-$600). Forms bond, 15-lb, rolls—1972 not available; 1974, $470; 1976, $519-$520; 1978, $538-$550; 1980, $697; 1981, $753; 1982, $753 ($680-$700).

Markets: Estimated shipments by end-uses are: bond, mimeograph, duplicating, xerographic—24%; forms bond—21%; offset printing—26%; envelope—11%; tablet—5%; other—13%.

Peroxide substitution can reduce bleaching chemical, energy costs

Partial replacement of chlorine dioxide with peroxide in second extraction stage of bleaching sequences possible without decreased pulp quality

By MICHAEL G. DODSON

☐ Recently the pulp and paper industry has experienced an unprecedented resurgence of interest in hydrogen peroxide bleaching of kraft pulp. This technology usually involves the partial replacement of chlorine dioxide by hydrogen peroxide. Previous papers (ref. 1 and 2) have described the addition of alkaline peroxide to the second extraction stage (E_2) to reduce ClO_2 consumption in the $D_1$and D_2 stages of $CE_1HD_1E_2D_2$ and $CE_1D_1E_2D_2$ sequences. Evaluations in the laboratory and in the mill have shown that at least 25% of the applied ClO_2 in a bleaching sequence can be replaced by peroxide in a 2:1 ratio (by weight). One overriding factor, economics, has spurred ten kraft mills to evaluate peroxide in the second extraction stage during the last three years.

H_2O_2 substitution provides the following benefits:

- Chemical cost savings
- Energy cost savings
- Possible capital cost savings
- Improved bleach plant efficiency.

The manufacture of sodium chlorate is very energy-intensive. Approximately 50% of the total manufacturing costs and 75% of the variable costs are directly related to energy. Figure 1 shows the relationship of sodium chlorate list prices to energy costs. Both electrical power and chlorate prices have increased dramatically in the past decade. On the other hand, hydrogen peroxide manufacture by the auto-oxidation of anthraquinone is less energy-dependent, with only one-quarter of the total costs tied to energy.

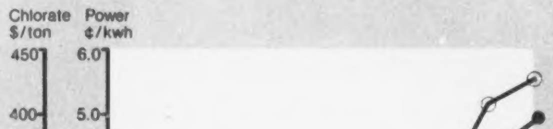
From 1970 to 1982, the average yearly price increase for sodium chlorate was 9.6%, while the average inflation rate ran 7.8%. In comparison, price increases for hydrogen peroxide averaged only 3.1% in the same period. The net result has been a favorable economic picture for peroxide vs chlorine dioxide. Figure 2 qualifies the change in

TABLE 1: **Mill A—kraft softwood*: K number = 23**

	Standard bleach sequence CE/HDED	Hydrogen peroxide bleach sequence CE/HDPD	Difference
ClO_2 applied (lb/a.d. ton)	24.6	18.4	6.2
H_2O_2 applied (lb/a.d. ton)	—	3.0	3.0
Brightness (Elrepho)	89.8	91.4	1.6
Dirt	2.1	2.8	0.7
CEK number (permanganate number)	4.1	3.9	0.2
Tower temperatures			
D_1 (°F)	140	130	10
E_2 (°F)	160	155	5
D_2 (°F)	160	150	10

*80% softwood and 20% hardwood

FIGURE 1: **Chlorate price dependency on power cost**



Source: *Monthly Energy Review;* Sept. 1982, p. 92

Mr. Dodson is industrial manager, Interox America, Houston, Texas economics of this technology based on list pricing of chlorate (converted to ClO_2 costs) and peroxide, with a replacement ratio of 2:1.

Benefits of substitution

The two major benefits of peroxide substitution are an overall reduction in chemical and energy costs. Although all mills with CEDED or CEHDED sequences have the potential for obtaining these benefits, each mill should evaluate its own specific case based on the following key factors:

- Cost of ClO_2 generation
- ClO_2 production capacity vs bleached pulp production capacity
- Mill incremental steam costs
- Pulp quality
- Capital costs for implementation.

Production costs for chlorine dioxide vary widely throughout the paper industry, typically \$0.40 to \$0.60/lb, due to different methods for ClO_2 production (i.e., R-2, Mathieson, Solvay, R-3, SVP), variations in ClO_2 generator efficiency, and mill accounting practices. As a general rule, only the variable costs should be considered when making a preliminary economic evaluation; since fixed costs—such as labor, maintenance, and depreciation—will not change, they don't have to be considered.

Chemical and power costs represent the two key variable charges. Additional variable charges include royalty fees and catalyst use. Appendix A, a typical cost-analysis sheet, can help in calculating variable and fixed costs for chlorine dioxide generation.

Chlorine dioxide generators vary in efficiency depending on the type of generator and on its actual operation. Generators operated at a higher production level than design capacity and without proper routine maintenance may not perform efficiently. Theoretically, for an R-3 or SVP generator, 1.65 lb of sodium chlorate are required to produce a pound of ClO_2. However, in general, when a generator is performing well, 1.80 lb of chlorate is consumed per lb of ClO_2 produced. It is important to qualify the generator's efficiency while operating under typical production conditions. Once the efficiency is determined by mass balance, it should be correlated with accounting receipts for chlorate purchases.

Chlorate and either spent acid or saltcake are byproducts of the more popular ClO_2 generators. Realistic credits for the value of these byproducts to the mill can be subtracted from the cost of producing ClO_2. Credits should not, therefore, be taken for excess byproducts that end up in the sewer, such as saltcake, spent acid, or hypo. In fact, reducing chlorine dioxide consumption could improve the overall mill chemical balance. The amount of these byproducts can be calculated theoretically, but this should be confirmed by actual measurements for construction of a chemical mass balance.

At some mills, pulp production rates require ClO_2 in quantities which match or exceed rated generating capacity. By using hydrogen peroxide in these cases, the mill can bleach incremental tonnage without high capital expenditures (\$1- to \$2-million) for a new ClO_2 generator. This practice would not only improve profits but also increase the ClO_2 efficiency of the generator by allowing it to run closer to rated capacity.

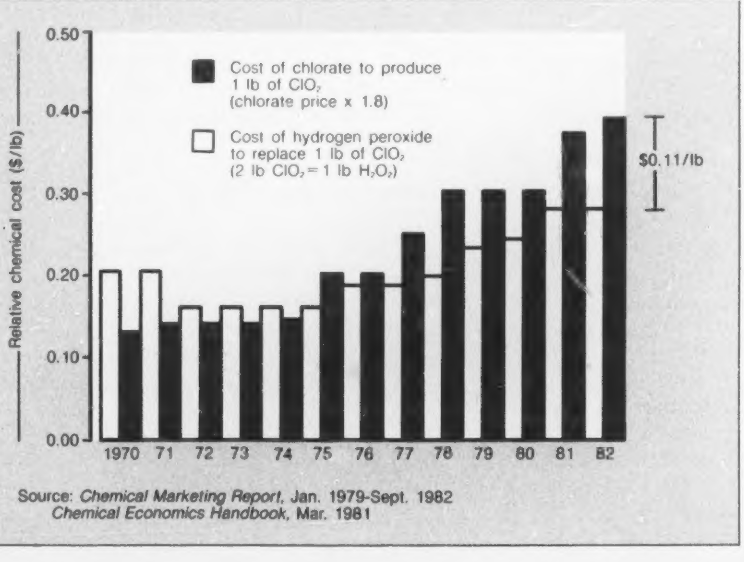
As a result of peroxide introduction into the second extraction stage, bleaching activity is distributed more equitably across the final three stages. Reducing ClO_2 in $D_1$and D_2 allows significantly lower tower temperatures which allows control of the residuals in these stages.

Potential energy savings from peroxide substitution can equal the chemical savings, depending on mill incremental steam costs. The highest incremental steam cost, rather than mill average steam cost, should be used when this savings is calculated because demand for supplemental fossil fuel in a power boiler would be reduced, as opposed to reducing the load of a recovery or hogged fuel boiler.

Effect on pulp quality

With any process change in the bleach plant, the effect on pulp quality must be carefully considered. The parameters possibly affected by peroxide substitution include brightness, stability, viscosity (as an indication of

FIGURE 2: **Chemical cost**



Source: *Chemical Marketing Report*, Jan. 1979-Sept. 1982
Chemical Economics Handbook, Mar. 1981

TABLE 2: **Mill A economics**

Total savings = \$453,000/yr
Chemical savings = \$191,000/yr
Steam savings = \$262,000/yr

Assume:
ClO_2 cost is \$0.42/lb
H_2O_2 cost is \$0.395/lb (70% H_2O_2)
Steam cost is \$3.25/1000 lb steam
Production is 600 a.d. tpd

pulp strength), and dirt count. Laboratory bleaching studies can define the effects of the first three variables. Unfortunately, statistically reliable data on dirt level cannot be generated in the laboratory.

The efficiency of chlorine dioxide for shive bleaching might imply an increase in dirt level with a reduction in chlorine dioxide. A difficult question that must be answered in each mill location is: How much ClO_2 is necessary for achieving pulp cleanliness standards? Each mill should consider the four parameters which heavily affect dirt level: chip quality, cooking, screening, and chlorination. Previous experiences indicate that, when reasonable process performance standards are met for these four parameters, substitution will not detrimentally affect dirt level.

If quality or control problems exist in any of these areas, then bleach plant chemical costs will be high, and bleached pulp quality will be erratic. In addition, large variations in pulp quality make statistical analysis of hydrogen peroxide trial results difficult. In other words, from the standpoint of both mill and supplier, major performance problems in the above four key areas should be resolved prior to any attempt to optimize bleach plant chemical costs.

When there are no major concerns over the dirt-level factors, it is much easier to implement hydrogen peroxide addition to the second alkaline-extraction stage. The required storage and handling system includes an aluminum bulk storage tank for 50% peroxide, a peroxide metering pump and flowmeter, piping from the storage tank to the D_1 washer/repulper, and a dilution method for reducing the peroxide strength to assure uniform mixing with the pulp.

Capital expense for the system should not exceed $100,000, provided an appropriate site for the storage tank is available. Additional requirements for handling peroxide stabilizers are not normally needed in this application. Also, the acidic chlorination and initial chlorine dioxide stages remove enough of the heavy metals normally present in the pulp to avoid wasteful decomposition of the peroxide. When unusually high levels of heavy metals, such as iron or manganese, are present in the mill process water, then stabilizers should be considered.

H_2O_2 case histories

After considering all the key factors, three Southern kraft mills decided to investigate the use of hydrogen peroxide. Results obtained from trials at these three mills are described below.

Mill A produced 600 tpd of 89° brightness softwood and hardwood pulp. Hardwood and softwood chips were pulped separately in batch digesters and blended prior to brownstock washing. The mill's interest in peroxide arose due to an expansion which required the bleach plant to produce 750 tpd. Since the mill's R-2 generator was producing above capacity, hydrogen peroxide was a reasonable alternative to rehabilitating an old chlorine dioxide generator.

Table 1 represents one month of data prior to the trial and one month of data using hydrogen peroxide in the second extraction stage. The chlorine dioxide application level was reduced from 24.1 lb/ton to 18.4 lb/ton while maintaining (comparable) dirt level and *improving* the final pulp brightness. Table 2 shows potential economic results based on the technical data. The costs of steam, ClO_2, and H_2O_2 do not represent this individual mill's specific costs but instead present a conservative estimate to establish the magnitude of savings when using peroxide in this application. In fact, actual mill savings exceeded the amounts shown in all examples (Tables 2, 5, 6, and 8) in this article.

TABLE 3: **Mill B—kraft hardwood: K number = 12**

	Standard bleach sequence CEDED	Hydrogen peroxide bleach sequence CEDPD	Difference
ClO_2 applied (lb/a.d. ton)	20.8	15.0	5.8
H_2O_2 applied (lb/a.d. ton)	—	2.5	2.5
Brightness (Elrepho)	91.1	91.3	0.2
Dirt	4.7	3.0	1.7
CEK number (permanganate number)	1.2	1.1	0.1
Tower temperatures			
D_1 (°F)	206	171	35
E_2 (°F)	171	165	6
D_2 (°F)	163	160	3
Viscosity-D_2 (cps)	18.2	19.0	0.8

Mill B is a large market pulp mill with two lines—one hardwood and one softwood. Hardwood is produced with a Kamyr continuous digester, while softwood is produced in an Esco digester. Mill production capabilities were limited by the capacities of two ClO_2 generators (R-2, SVP). The installation of a peroxide system for each bleach plant removed the chlorine dioxide production bottleneck. The mill can now routinely boil out the SVP generator and operates the R-2 generator only 25% of the time.

Tables 3 and 4 show that chlorine dioxide consumption dropped significantly while pulp quality was maintained. It should be noted that tower temperatures were reduced notably without an increase in dirt counts for the pulp. Table 4 compares a month's data prior to peroxide use and a month's data after eight months of peroxide use. This data show that the anticipated results occur not only under controlled trial conditions but also under routine operating conditions.

Mill C produces 700 tpd of bleached softwood for bleached foodboard and for market sales. In this application, 3.5 lb/ton of peroxide replaced 6.4 lb/ton of ClO_2. Although the replacement ratio was less than 2:1, the trial proved that tower temperatures can be brought below any previously expected level under specific mill situations. The D_1 and D_2 tower temperatures were reduced significantly while brightness and dirt count were slightly improved, as Table 7 shows.

Increased interest in use of hydrogen peroxide in kraft pulp bleaching is primarily due to the overall improvement in bleaching costs. Mills are evaluating the key factors concerning peroxide use and consider its advantages well worth implementing. Although hydrogen peroxide is unique as a nonpolluting selective bleaching chemical, its future will be determined to a large extent by utilizing these properties in an *economical* framework. ☐

REFERENCES

1. R.R. Kindron, *Tappi*, 62 (9): 67 (1979).
2. H. Loutfi, *Pulp & Paper Canada*, 81 (12): T374 (1980).

TABLE 4: **Mill B—kraft softwood**

	Standard bleach sequence CEDED	Hydrogen peroxide bleach sequence CEDPD	Difference
ClO_2 applied (lb/a.d. ton)	30.9	21.1	9.8
H_2O_2 applied (lb/a.d. ton)	—	5.0	(5.0)
Brightness (Elrepho)	90.6	90.4	0.2
Dirt	16.9	16.3	0.6
Tower temperatures			
D_1 (°F)	200	165	35
E_2 (°F)	172	159	13
D_2 (°F)	196	166	30
Viscosity-D_2 (cps)	11.2	14.4	(3.2)

TABLE 7: **Mill C—kraft softwood: K number = 21**

	Standard bleach sequence CE/HDED	Hydrogen peroxide bleach sequence CE/HDPD	Difference
ClO_2 applied (lb/a.d. ton)	30.9	24.5	6.4
H_2O_2 applied (lb/a.d. ton)	—	3.5	3.5
Brightness (Elrepho)	88.0	88.9	0.9
Dirt	0.5	0.2	0.3
CEK number (permanganate number)	4.6	5.0	0.4
Tower temperatures			
D_1 (°F)	156	121	35
E_2 (°F)	154	139	15
D_2 (°F)	171	147	24
Viscosity-D_2 (cps)	14.9	15.0	(0.1)

APPENDIX A: **Pulp and paper production cost estimate: 1985**

Date: ______ **Product: Chlorine dioxide** By: ______

Line	Item	Escalation: (1980 base)	
1.	Plant location	Power:	18%/yr
2.	Process	Labor:	10%/yr
3.a.	Capacity, ____/yr	Capital:	8%/yr
b.	Capacity, ____/stream day	Steam:	10%/yr
4.	Operating factor, %	Raw materials:	8%/yr
5.	Capital investment	Taxes and insurance	6%/yr
a.	Battery limits, $		
b.	Off-sites, @ ______/%		
c.	Total, $		

	6. RAW MATERIALS					
a.	Material	Raw material efficiency	Lb material/lb product Theoret.	Actual	Unit price	Cost/lb of product
b.		%				
c.						
d.						
e.						
f.						
7.	Total raw material cost:					

	8. UTILITIES			Cost/lb of product
	Item	Usage	Unit price	
a.	Electric power		____/kWh	
b.	Steam		____/000 lb	
c.	Water, cooling		____/000 gal	
d.	Water, process		____/000 gal	
e.	Fuel (specify)		____/____	
f.	Other (specify)		____/____	
9.	Total utilities			

Line	Item	
10.	LABOR	
a.	Operating labor	
b.	Supervision	
c.	Percentage allocated cost @ ______%	
d.	Maintenance service	
e.	Yard service	
f.	Laboratory service	
11.	Total labor:	
12.	SUPPLIES:	
a.	Operating	
b.	Maintenance	
13.	Total supplies	
14.	Total direct costs, ____/____	
15.	Administration @ ______%	
16.	Depreciation @ ______%	
17.	Taxes and insurance @ ______%	
18.	Cost of shipping, containers, etc.	
19.	Total indirect costs, ____/____	

TABLE 5: **Mill B economics (hardwood)**

Total savings = $699,000/yr
Chemical savings = $215,000/yr
Steam savings = $484,000/yr

Assume:
ClO_2 cost is $0.42/lb
H_2O_2 cost is $0.395/lb (70% H_2O_2)
Steam cost is $3.25/1000 lb steam
Production is 600 a.d. tpd

TABLE 6: **Mill B economics (softwood)**

Total savings = $1,124,000/yr
Chemical savings = $272,000/yr
Steam savings = $852,000/yr

Assume:
ClO_2 cost is $0.42/lb
H_2O_2 cost is $0.395/lb (70% H_2O_2)
Steam cost is $3.25/1000 lb steam
Production is 600 a.d. tpd

TABLE 8: **Mill C economics**

Total savings = $932,000/yr
Chemical savings = $149,000/yr
Steam savings = $783,000/yr

Assume:
ClO_2 cost is $0.42/lb
H_2O_2 cost is $0.395/lb (70% H_2O_2)
Steam cost is $3.25/1000 lb steam
Production is 600 a.d. tpd

Zinc coatings: where, how to use them for best corrosion control

Topcoated zinc coatings can protect structured steel in most harsh mill environments; appropriate types to use in various areas are discussed

By ROGER J. TEGTMEYER

☐ Corrosion is obviously a major concern of mill maintenance, production, and engineering personnel. For example, a PULP & PAPER survey (Dec. 1980, p. 108) indicated that maintenance personnel considered corrosion their third-greatest maintenance problem. An earlier survey revealed corrosion to account for 20% of the maintenance budget—for both the process side and atmospheric corrosion. The cost of corrosion has been quantified as high as $1/ton of pulp. A wide range of corrosion problems, as detailed in Table 1, are made more complex by the proximity of processes, climatic conditions, mill management policies, and operating procedures.

The protection provided by zinc is vital to the preservation of steel surfaces in pulp and paper mills. However, to assure long service life, as much as 70% of steel surfaces protected by a zinc-rich film should be topcoated. An even higher percentage of such surfaces should be topcoated if they are exposed to prolonged chemical fallout during construction in an existing operating mill—even if they are to be installed in a relatively "benign" area. Thus, topcoats for zinc films are an integral component of protection in pulp and paper mills.

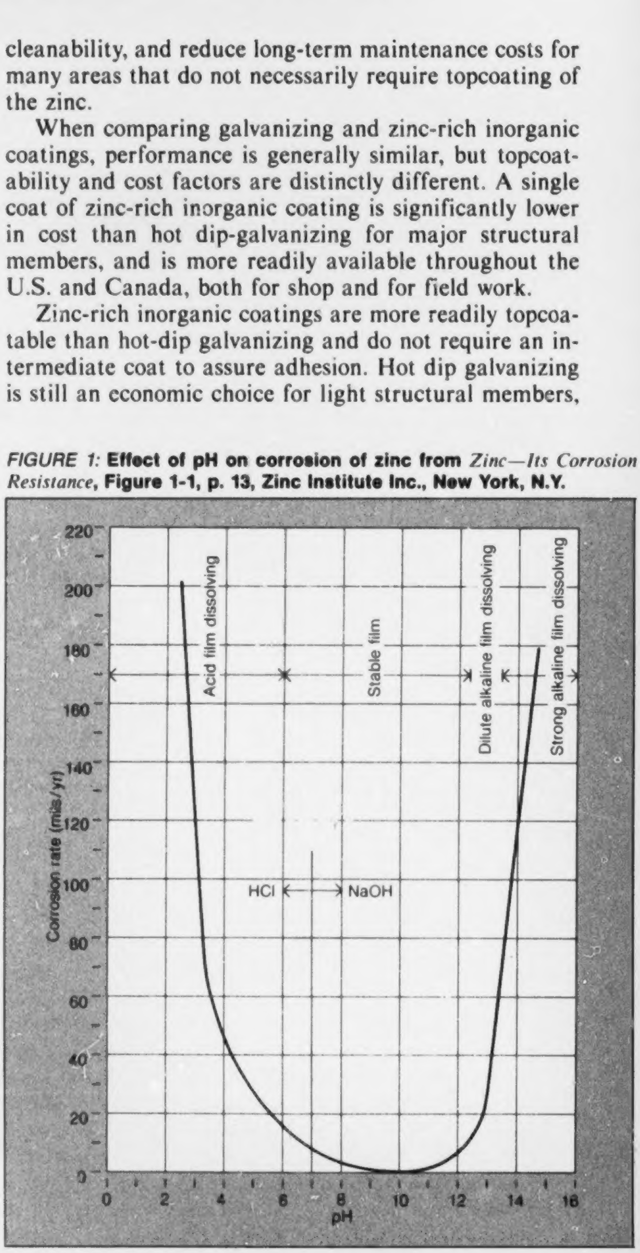
Zinc film protection

Many areas of a pulp and paper mill can be protected with just a single coat of zinc, either as hot-dip galvanizing or zinc-rich inorganic coating. Zinc provides protection from edge rusting, the most prevalent form of atmospheric corrosion which, if left unchecked, will contribute to total failure. However, even zinc films must be protected (topcoated) in some pulp and paper mill environments. Topcoating will also enhance service life, increase cleanability, and reduce long-term maintenance costs for many areas that do not necessarily require topcoating of the zinc.

When comparing galvanizing and zinc-rich inorganic coatings, performance is generally similar, but topcoatability and cost factors are distinctly different. A single coat of zinc-rich inorganic coating is significantly lower in cost than hot dip-galvanizing for major structural members, and is more readily available throughout the U.S. and Canada, both for shop and for field work.

Zinc-rich inorganic coatings are more readily topcoatable than hot-dip galvanizing and do not require an intermediate coat to assure adhesion. Hot dip galvanizing is still an economic choice for light structural members,

FIGURE 1: **Effect of pH on corrosion of zinc from** *Zinc—Its Corrosion Resistance*, **Figure 1-1, p. 13, Zinc Institute Inc., New York, N.Y.**



Mr. Tegtmeyer is manager of maintenance sales, Carboline Co., St. Louis, Mo.

floor plates, grating, handrail and toeboards, ladder cages, cable trays, pipe hangers, and possibly girts and purlins. However, because of the difficulties of overcoating, it is best restricted to areas not requiring topcoats. Overall, zinc-rich inorganic coatings, with appropriate topcoats where indicated, have distinct advantages for the protection of steel surfaces throughout pulp and paper mills.

A film of zinc protects steel in two ways: (1) it provides cathodic protection when the substrate is exposed to the environment, and (2) it acts as a barrier film between the environment and the substrate. More specifically these forms of protection are:

Galvanic effect. The stable form of iron in nature is iron oxide. When metallic iron is exposed to the atmosphere, it tends to oxidize (rust). When iron is coupled with a less noble metal (one having a greater oxidation potential) such as zinc, in the presence of an electrolyte, a galvanic cell is formed. In this cell, iron becomes the cathode and zinc the anode; thus iron is protected against oxidation corrosion and zinc is sacrificed (see Figure 1).

Barrier film protection. Zinc also protects steel by forming a barrier film between the corrosive environment and the steel. This is a function of the stability of zinc (with protective zinc carbonate on the surface) in a wide variety of environments. In strong acid or base environments, insoluble basic zinc salts are not formed, and the local corrosion rate becomes so rapid that the sacrificial zinc reaction is of little consequence or value.

Extensive testing by the Zinc Institute indicates that for immersion service the solution pH should not be below 5 or 6 or higher than 12 to minimize the local reaction rate (see Figure 1). The rate of local reaction and, thus, service life in relatively neutral atmospheric exposures is a function of the duration and frequency of moisture contact, rate of surface drying, and extent of chemical fallout.

Despite the amphoteric nature of zinc films, zinc can provide excellent protection in many exposures and is very useful in corrosion control of structures in pulp and paper mills. Zinc-coated steel is very resistant to damage in shipment. Normally, zinc-coated structural steel will suffer negligible damage; the film does not delaminate (the zinc tends to burnish into the steel surface). Because of the galvanic cell reaction, zinc films are able to protect damaged areas.

Of particular importance in the protection of structural steel, zinc films have the ability to protect edges. Figure 2 illustrates the tendency of structural steel, without the benefit of zinc, to develop rust breakthrough at the edges. Edge rusting leads to undercutting and premature failure of the system, rapidly escalating the cost of maintenance. A zinc film can effectively combat both edge rusting and undercutting.

Available zinc films

A film of metallic zinc must meet two important requirements to provide effective cathodic protection. The film must allow electrical contact between the metallic zinc and the metal substrate, and it must be capable of sacrificing freely without affecting the integrity of the film.

Two common forms of zinc films provide effective galvanic protection for industrial exposures. The historical form is galvanizing (specifically, hot-dip galvanizing) for structural shapes, piping, and some portions of equipment. This is applied by dipping in molten zinc, which

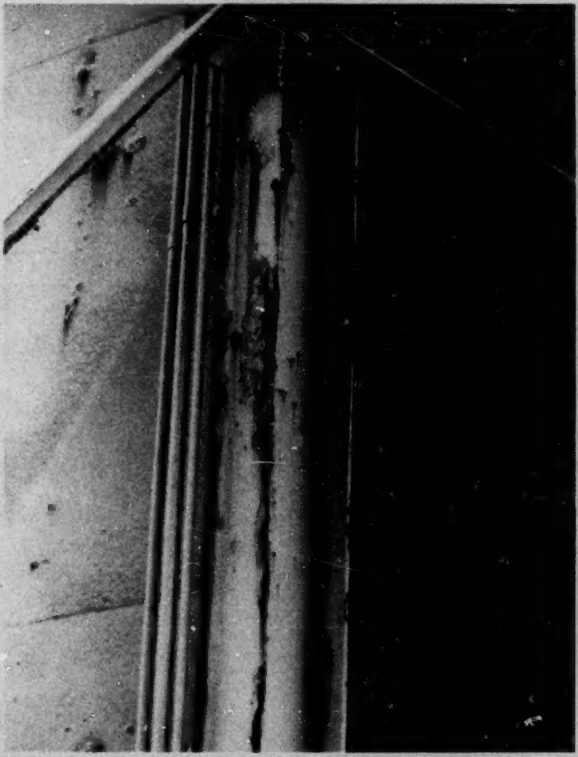


FIGURE 2: **Structural steel is susceptible to edge rusting and undercutting without protective coating.**

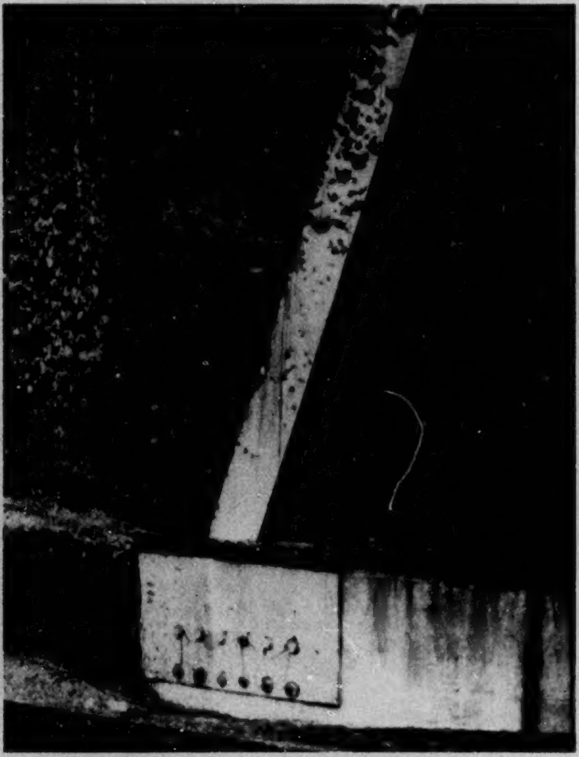


FIGURE 3: **Untopcoated zinc-rich ethyl silicate primer in causticizing plant of coastal pulp mill.**

typically produces a zinc-iron alloy film representing 50% to 70% of the total coating (which is topped by a layer of free zinc). A typical standard for after-fabrication galvanizing is ASTM A 123, with a specified average of 2.3 oz/ft^2, or 3.9 mils, for ¼ in. or thicker plates. A more modern approach, one that has been used increasingly since its development some 30 years ago, is the use of zinc-rich coatings with inorganic binders.

These coatings provide a film of zinc particles bonded by an inorganic vehicle that does not encapsulate or limit the electrical conductivity. These zinc-rich, inorganic coatings at a nominal dry film thickness of 3 mils (0.003 in.) are now used extensively in many industries, including pulp and paper mills.

It is generally recognized that a film of hot-dip galvanizing and a film of zinc-rich inorganic coating (with 86% minimum metallic zinc in the dried film) will provide equivalent performance (depending on the environment, one or the other has a slight advantage). Table 2 shows a cost comparison of zinc-rich inorganic coating and hot dip galvanizing. By general rule of thumb, zinc-rich inorganic coatings are more economical for all steel surfaces, except light structural steel with greater than 375 ft^2/ton, and for straight piping less than 10 in. in dia.

TABLE 1: **Typical pulp and paper mill exposures***

Area	Exposure	Typical pH range
Wood handling	Normally exterior exposure with splashing of water, abrasion and woodfiber buildup	5 to 8
Chipping and woodroom	Normally interior exposure with increased humidity and woodfiber buildup	5 to 8
Kraft or soda process pulping	Potential highly alkaline black liquor spills and white liquor fumes; very warm surfaces	10 to 14
Sulfite pulping	Fumes, spillage, and leaks of sodium magnesium or ammonium bisulfite and sulfate	2 to 11
Mechanical pulping	Generally humid interior exposure with steam wood acids and some fiber buildup	3 to 6
Semichemical pulping	Generally high humidity conditions due to steaming and steam vapor leaks and some fiber buildup	3 to 10
Pulp screening and cleaning	Extremely humid, often condensing environment with buildup and pulp and splash and spillage or immersion in diluted pulping chemicals	Dilution of pulping chemicals
Kraft or sulfite pulping bleaching	Generally a very humid interior exposure with chemical fumes and leakage of dilute bleaching chemicals which may include chlorine, chlorine dioxide, sodium hydroxide, sodium hypochlorite, hydrogen peroxide; also buildup of bleached or unbleached pulp	2 to 5-CL_2 and ClO_2 areas 11 to 13-NaOH areas. 8 to 11 hypochlorite areas
Mechanical pulping bleaching—hydrosulfite	Acidic vapors and fumes; high humidity	3 to 5
Papermaking	Very humid and water may spray at wet end; high humidity and very warm temperatures with frequent dry pulp buildup on surfaces above dryer section; frequently an area of condensation	3.5 to 6 which rise to 8 with alkaline sizing
Finishing and warehouses	Benign atmosphere with very little corrosive elements	Not applicable
Evaporators	Generally mild environment except for spills which corrosivity depends on type of pulping employed	10 to 12 for alkaline pulping and 3 to 8 for sulfite pulping
Recovery boiler	Normally interior exposure with warm surface temperatures from the boilers. Potential steam leaks, buildup of saltcake and flyash in localized areas and may also have leakage of pulping liquor	Ranges from alkaline spillage of black liquor or boiler water to acidic condensation of fluegas or sulfite liquor leakage
Causticizing	Interior or exterior exposure which is primarily buildup of lime dust but also spillage of green liquor, lime mud, white liquor; very hot near lime kiln; acids may be employed to clean lime filter; high humidity in the filter and the slaker area	Normally 10 to 14
Tall oil recovery	Pine oil is hydrolized to rosin and other organic acids with sulfuric acid; normally exterior exposure.	1 to 6
Chemical generation and handling	Generally mild environment except at leakage or spillage of bleaching chemicals consisting of chlorine, chlorine dioxide and sodium hypochlorite	2 to 7
Power and steam generation	Warm, dry interior exposure exposed to fallout or leakage of fuel, particularly in hogged fuel boilers	4 to 10
Water pollution	Generally exterior exposure with high humidity, chemical fumes and water splash above clarifiers and filters	4 to 10 4 to 10
General mill environment—kraft mills	Generally alkaline fallout exposure with strong chemical fumes and fallout in localized areas, particularly near vents of highly chemical or humid areas and caustic fallout from the causticizing plant	3 to 10
General mill environment—sulfite plants	Generally acidic environment and fallout which may be concentrated in localized areas; may also have fallout of wood fibers from chip handling	2 to 8

*Adapted from *TAPPI Press Report*, "Maintenance painting programs for maximum return on investment," 1982.

Hot dip galvanizing and zinc-rich inorganic coatings have specific advantages to the user. The following discusses the characteristics, advantages, and drawbacks of each:

Zinc-rich inorganic coatings. A zinc-rich inorganic silicate coating is simply a film of powdered metallic zinc bonded, but not encapsulated, by a silicate binder that generally has a very high efficiency of zinc availability. Zinc-rich inorganic silicate primers are available in a variety of forms: solvent-based and water-based, self-curing and post-cured, two-package and single-package. The most popular for corrosive atmospheres is a two-component material. For this discussion, however, "zinc-rich inorganic coating" is sufficient designation. Zinc-rich inorganic coatings have been used for the past 20 years throughout the U.S. and Canada for all areas of pulp and paper mills, as well as for entire grassroots mills. Results have been excellent.

In highly industrial areas, the Steel Structures Painting Council reports that zinc-rich coatings provide significantly longer protection than unpainted galvanized steel. Figure 3 shows a zinc-rich, inorganic primer on a blowtank support structure, untopcoated since 1977 with no deterioration. This is typical of experience with untopcoated, zinc-rich primers in recovery boilers since 1964. However, where zinc-rich inorganic primers are left untopcoated permanently, it is often recommended that film thickness be increased to 4 or 5 mils in one coat.

Hot-dip galvanizing. Hot-dip galvanizing also can provide economical protection for many steel surfaces of a pulp and paper mill. As with zinc-rich inorganic coatings, untopcoated galvanizing will provide excellent protection in marine exposures and relatively dry exposure to chemicals within a pH range of 5 to 10. Many paper mills have employed hot-dip galvanized items such as conduit hangers, switchgear steel, and miscellaneous steel with excellent service life.

TABLE 2: **Cost comparisons[1] (based on 250 ft^2/ton)**

Self-curing zinc-rich inorganic coating		**Hot dip galvanizing**	
In-shop	**Cost**	**In-shop**	**Cost**
SP-6 commercial blast (centrifugal blast equipment)	\$0.25/ft^2	Acid pickling and average 1½ oz/ft^2 galvanizing	\$0.10/lb
Cost of primer at 3 mils (30% loss)	\$0.11		
Application labor	\$0.22		
Total in-shop cost	\$0.581/ft^2 or \$145.25/ton	Total in-shop cost	\$0.10/lb[2] or \$375.00/ton
Topcoating in field[3]		**Topcoating in field[3]**	
Field touch-up	4	Field touch-up	4
High build epoxy topcoat at 4 mils		rve wash primer at 0.5 mils	
Labor	\$0.19	Labor	\$0.19
Material (30% loss)	\$0.091	Material (30% loss)	\$0.070
		High build epoxy topcoat at 4 mils	
		Labor	\$0.19
		Material	\$0.19
Total for field topcoating	\$0.281/ft^2 or \$70.25/ton	Total for field topcoating	\$0.64 or \$160.00/ton
Total for in-shop priming and field topcoat	\$215.50/ton	**Total for hot dip galvanizing and field topcoat**	\$535.00/ton

1. Labor and material costs for coatings are based on the NACE Corrosion/82 Paper No. 145 by A. H. Roebuck & G. H. Brevoort
2. Approximate cost of \$0.10/lb for 1.5 oz/ft^2 zinc is an average cost figure from 1979 and is likely to be higher in 1982. The 1.5 oz/ft^2 level of zinc protection is commonly specified but only 65% of the protection recommended in ASTM A123 of 2.3 oz/ft^2 for ¼-in. or thicker plate
3. Assumes topcoating after erection, but at ground level; figures for high levels topcoating or more complicated structures would increase costs proportionately for both systems
4. Touch-up requirements for both will be negligible

Hot dip galvanizing requires that certain design criteria be followed. Stiffeners, gusset plates, angle clips, and other weldments on structural members must be seal-welded. If one seal weld is bad, accelerated corrosion may occur due to penetration by the acid pickling bath. Tubular fabrications and hollow structurals must be properly vented. According to galvanizing industry specifications, high strength steels (specifically high silicone steels) must not be hot-dip galvanized.

Finally, fabricated structural members, particularly those dipped one end at a time to coat the whole beam, will often warp and twist in the molten zinc bath, causing difficulties in erection. Guidelines for minimizing distortion and warpage are provided in ASTM Recommended Practices A384[7]. Of course, corrosion prevention should be a design criterion for all structures.

Topcoat requirements

The primary advantage of a zinc film, compared with any other protective coating, is its reactivity, i.e., its ability beyond that of a barrier film to provide galvanic protection. It is that reactivity, however, that necessitates topcoating to isolate the environment from the zinc. Table 3 lists areas where topcoats may be necessary to ensure long term protection of the substrate. In many mill areas where the pH range is relatively neutral and wet-dry cycles are infrequent, no topcoat is required for long service life (in excess of 20 years).

In other areas the surface may be exposed to periodic condensation (e.g., paper machine room) oxidizing atmospheres (e.g., bleach plant), or caustic buildup (e.g., caustic plant). The zinc will be subject to attack in these areas. For example, service life of the protective zinc film is substantially affected by the wet-dry cycles on struc-

TABLE 3: **Guidelines for topcoating zinc coatings**

Area	**Topcoat recommendation**
Wood handling	Suggested
Chipping and woodroom	Suggested
Alkaline pulping	Recommended
Sulfite pulping	Recommended
Mechanical pulping	Suggested
Semichemical pulping	Suggested
Pulp screening and washing	Recommended
Bleaching–kraft and sulfite pulp	Required
Bleaching–mechanical pulping	Required
Papermaking	Recommended
Finishing and warehousing	Not required
Evaporators	Suggested
Recovery boiler	Suggested
Causticizing	Suggested
Tall oil recovery	Recommended
Chemical generation and handling	Recommended
Power and steam generation	Not required
Water pollution control	Not required
General mill environment-kraft and sulfite mills	Recommended

Note: The above recommendations are based on the assumption that the areas named are separate entities and are protected from fallout from other areas. If not, the recommendation for topcoating should be based on the most aggressive exposure in the area.

tural surfaces common to pulp mills and overhead structural steel of paper machine rooms.

If condensation evaporates quickly from these surfaces, corrosion is not severe due to the protective zinc carbonate film. However, severe corrosion can occur when water remains in contact with the zinc under high humidity conditions, particularly in poorly ventilated areas.

Topcoating will protect the zinc film and preserve cathodic protection of bare metal and resistance to undercutting. Experience has shown that maintenance before significant rusting has occurred is the most cost-effective maintenance cycle.

Sandblasting of substantially deteriorated surfaces is extremely costly (as much as 50% of the overall cost of repainting). In many areas of a paper mill, sandblasting is impractical, if not impossible. Thus, initial topcoating may be the best way to protect a zinc investment and reduce maintenance costs over the many years of expected service.

Topcoatability

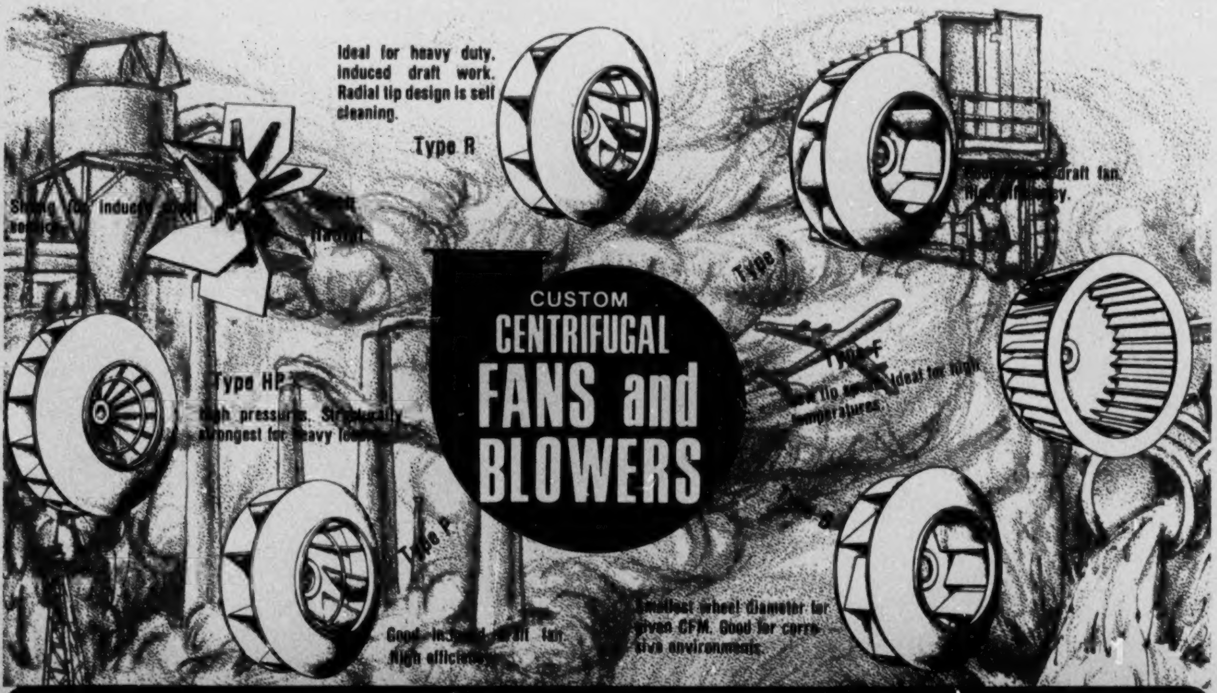
Significant differences exist in the topcoatability of zinc-rich inorganic coatings vs hot-dip galvanizing.

Zinc-rich inorganic coatings are readily topcoated. Because they are generally topcoated, they are frequently referred to as primers. With a high-build epoxy polyamide topcoat, as recommended in a recently released TAPPI report on protective coatings for the pulp and paper industry, steel systems have exhibited many years of excellent service in virtually all areas of both sulfite and kraft mills.

Topcoating is of such value to overall performance that often a lower zinc loading, such as 75% zinc in the dried film, will not compromise long-term performance. Zinc-rich inorganic coatings with topcoats can be very economical. For example, a system of steel primed in the shop, with field touchup and field topcoat, totals \$0.86/ft^2 or \$215.50/ton. This compares very favorably with the cost of topcoated galvanizing even at 1.5 oz of zinc/ft^2.

Topcoating hot-dip galvanizing is not a simple matter. Normally, two methods are used to achieve good adhesion of topcoats: phosphoric acid wash or a phosphoric acid/polyvinyl butyral (PVB) wash primer. However, both of these methods have drawbacks that are made worse by the chromate treatment used to inhibit early salting of galvanized surfaces.

The treatments should be omitted if galvanizing is to be topcoated when new. Phosphoric acid washes can yield inconsistent results because of the lack of visual confirmation of treatment, allowing skipped areas. The PVB wash primers are more commonly employed and, if applied at the recommended 0.5 mils, can yield excellent results. However, the configuration of structures contributes to excess film thickness. Films in excess of one mil tend to result in delamination of the topcoats, particularly cross-linked topcoats. Topcoatability and adhesion of topcoats improve with aging and formation of the insoluble zinc salts, but thorough cleaning is necessary so that topcoats are not also applied over soluble salts. ☐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Inland Container's anaerobic effluent system working well

First paper industry anaerobic effluent treatment system in North America is highly successful at Inland Container's board mill in Newport, Ind.

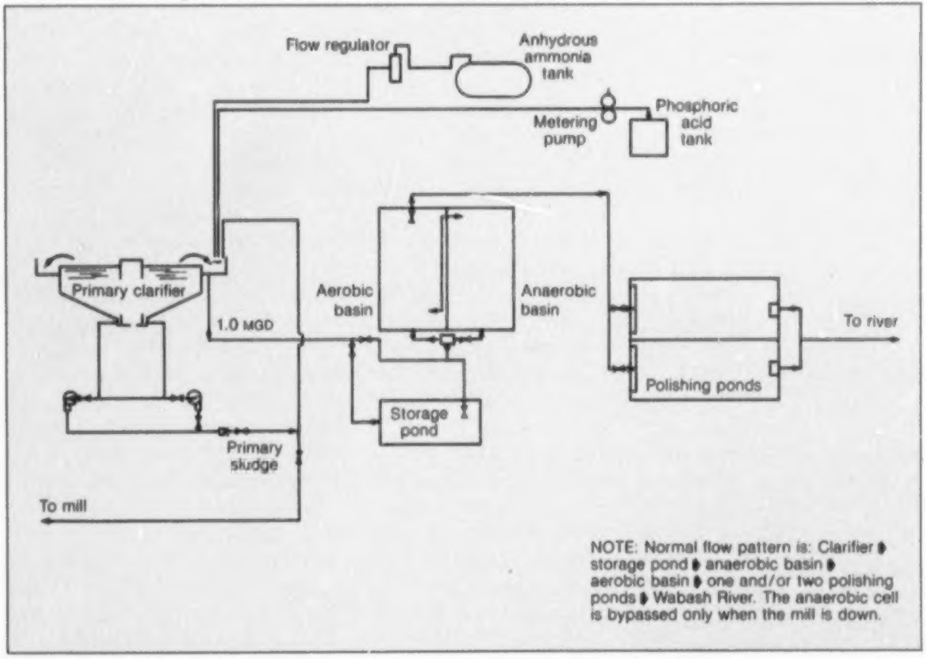
By CHARLES J. PRIEST

☐ Significant engineering advances in the use of anaerobic digestion for waste treatment have been made in recent years. Today, anaerobic digestion, e.g., without the use of oxygen (air), is widely used by municipal plants to stabilize secondary sludge (although in the U.S. it has not been applied directly to municipal effluent). However, only in the past few years has industry seriously considered direct anaerobic treatment.

Due to the original applications of anaerobic digestion for stabilization of municipal wastewater sludges, this process was believed very slow compared with aerobic treatment. Eventually, it was found that this erroneous understanding was due to the nature of the organic feed to both processes. Aerobic biological processes treat the simple organic substrates that are soluble or colloidal in nature and easily degraded. However, the anaerobic digestion processes are used to treat the sludges, which are more complex, particularly the difficult-to-degrade bacterial cells generated profusely by the aerobic process.

In effect, anaerobic digestion is really the "workhorse" of the municipal treatment plant. Approximately one-third of the influent biological oxygen demand (BOD) is removed in primary sedimentation and sent to the anaerobic digester. Of the remaining BOD which enters the aerobic process, about half is converted to carbon dioxide; the remainder is bacterial cells, which are also sent to the anaerobic digesters. Therefore, the anaerobic proc-

FIGURE 1: **Flow diagram of anaerobic/aerobic effluent treatment at Inland Container Corp.**



NOTE: Normal flow pattern is: Clarifier ➧ storage pond ➧ anaerobic basin ➧ aerobic basin ➧ one and/or two polishing ponds ➧ Wabash River. The anaerobic cell is bypassed only when the mill is down.

Mr. Priest is technical services supervisor, Inland Container Corp., Newport, Ind.

ess must stabilize about two-thirds of all pollution entering a conventional municipal plant.

However, in the evolution of waste treatment, a great need existed to convert the soluble and colloidal fractions into a form that could be separated by gravity settling. Therefore, the penalty of high secondary sludge production was "masked" by the fact that an acceptable effluent could be produced. Initially, ample land and oceans were available to dispose of sludge readily, and energy was cheap. This situation has changed drastically. In recent years, sludge disposal problems have been a significant factor in the growing interest in anaerobic digestion.

The anaerobic process

A primary obstacle to direct application of anaerobic treatment is the lack of a fundamental understanding of the biochemistry and microbiology of the process.

This treatment of sludge, a complex organic matter, involves a sequential process of hydrolysis, acid formation, and methane fermentation. The microbial population is comprised of many different anaerobic bacteria which maximize chemically bound oxygen (not dissolved oxygen). If present in the waste, the nitrate ion (denitrification) and sulfate ion (sulfate reduction) are also used for the oxidation of organic waste. In balanced digestion, the separate steps of the process occur simultaneously.

Anaerobic digestion combines a high degree of waste treatment with a low production of biological solids. Growth of the methane bacteria population is very small and is dependent on the type of effluent being treated. Highest sludge growth is obtained with carbohydrates and the lowest with volatile fatty acids.

Stabilization attained in anaerobic treatment is directly related to methane production. Anaerobic bacteria grow slowly and are sensitive to environmental changes (especially methane bacteria). Therefore, insight into the effect and possible interrelations of various environmental factors should be considered.

The three temperature ranges for anaerobic digestion are: 122°F to 149°F, 68°F° to 113°F, and below 68°F. Not only may the process move faster under the higher temperature conditions, but it is often presumed to be more sensitive in that range. With simple substrates, the process still proceeds at temperatures as low as 50°F.

The optimum pH range for anaerobic digestion is 6.8 to 7.2, but the process still proceeds successfully in the 6.0 to 8.0 range. In digestion of the more complex substrates, it should be noted that acid forming organisms are significantly less susceptible to acidic pH conditions than the methane bacteria. Although the nutrient requirements in anaerobic treatment are low, the minimum amount of all essential nutrients must be present in an available form. If not, poor chemical oxygen demand (COD) removal will result. With a view to the process, a slight overdose of nutrients should be considered.

TABLE 1: **Monthly average data before and after changeover**

Year	Month	Lb BOD/day influent	Lb BOD/day removed anaerobic & aerobic	Efficiency % total system
1976	Average	8,955	Aerobic only—7980	89.1
1977	Average	10,795	Aerobic only—9481	87.8
1978	Average	15,700	Aerobic only—13,368	85.1
1979*	Average	20,256	Combined anaerobic and aerobic—18,604	91.8
1980	Average	17,945	Combined anaerobic and aerobic—16,936	94.4
1981	Average	19,366	Combined anaerobic and aerobic—18,929	97.7
1982	Average**	23,418	Combined anaerobic and aerobic—22,910	97.8

*System converted to anaerobic digestion with aerobic polishing

**January–July 1982

Anaerobic treatment features

Features of the anaerobic treatment process include very low energy requirements, production of methane as a useful end product, low production of secondary sludge, low nutrient requirements, and high organic loading rates (much higher than with aerobic digestion). Another important feature for industrial concerns is that well-adapted anaerobic sludge, stored at temperatures in the range of 39°F to 68°F, does not deteriorate.

Although the anaerobic process is rather sensitive to specific environmental factors, it is very capable of accommodating itself to environmental alterations. If operated within its limits with respect to loading rate, pH, buffer capacity, and temperature, anaerobic digestion is a stable and effective treatment method. Parameters of prime interest in controlling the process are pH, gas production, gas composition, temperature, and active solids washout. Automatic control of the process can be accomplished with relative simplicity by maintaining proper balance between volatile acids and alkalinity.

Inland Container installation

Requirements for anaerobic digestion of effluent at Inland Container Corp.'s Newport, Ind., mill were established through pilot studies. Permission to convert to an anaerobic/aerobic system was obtained from the state in November 1978. The changeover was made immediately.

The mill's effluent system originally consisted of a primary outflow pond, two aeration basins (5 million gal each) and two polishing ponds (3 million gal each). The polishing ponds were operated in parallel or separately, depending on requirements. They were used for settling and removal of secondary sludge. The accumulated secondary solids in the polishing ponds were applied to farmland by a spray irrigation system. Since effluent quality improved significantly after the changeover, spray irrigation is no longer used.

The first step in the changeover was preparation of one of the two existing aeration basins for conversion to an anaerobic cell. All aeration equipment was removed from the basin, which was then decanted and seeded with biomass that had been allowed to become acclimated to anaerobic conditions. It was obvious that normal atmospheric temperature variations from summer to winter would adversely affect the efficiency of the anaerobic cell. To overcome this, the surface was insulated with Styrofoam sheets. The other basin continues to provide aerobic treatment. It handles the effluent flow from the anaerobic cell to provide any necessary final treatment.

As shown in Figure 1, outflow from the primary clarifier goes to a storage pond, then to the anaerobic cell. Sludge from the bottom of the primary clarifier is sent to the mill stock system. The anaerobic cell overflows to the aerobic basin for aeration, which discharges to two parallel polishing ponds for settling the secondary sludge.

Results obtained

From January to October 1979, the mill was learning to control the process, modify flow patterns, and establish a stable system. In October 1979, the anaerobic cell destroyed 80% of the BOD entering it. The effluent system's overall efficiency has been well over 90% since June 1979. For the past 16 months, efficiency (including the aerobic phase) has been 98%.

Table 1 shows annual averages of influent BOD, effluent BOD, and percent BOD destroyed. The influent BOD concentration has shown almost a continual increase since startup. It was 843 mg/l in 1975, and rose to 2300 mg/l by the end of 1979. For the past two years, concentrations have been 2400 to 3000 mg/l. Effluent BOD, on the other hand, averaged 175 to 187 mg/l from 1975 through 1977, and 220 mg/l in 1978. From June 1979 through August 1980, it averaged 98.6 mg/l. In 1981, the average effluent BOD was 53.2. From January to July 1982, it averaged 36.2 mg/l.

Prior to installation of the anaerobic system, the polishing ponds required emptying of sludge twice each year. Approximate volume was 12 million gal/year. Since the changeover to an anaerobic/aerobic system, the mill has had to remove only 3 million gal of sludge every 2.5 years. Thus, sludge handling after the changeover has been approximately one-tenth what it was with aerobic operation only.

The anaerobic basin has now been in operation for four years. The BOD destroyed by the anaerobic basin to date has theoretically produced 2 million lb of anaerobic bodies. At a 10% solids concentration, the anaerobic cells would be half full of sludge and require emptying soon. Actual measurements do not confirm theory. Samples taken 1.0 to 1.5 ft off the bottom show 5% to 6% solids. The anaerobic biomass is either settling to a very high degree or destroying itself. A three-week study of sludge destruction showed a 70% solids reduction (5.2% to 1.6% solids). The mill has not been able to obtain samples 6 in. to 1.0 ft off the bottom since the sampler will not penetrate the mass.

Other benefits

Anaerobic digestion has resulted in benefits other than improved effluent quality. These include:

- An increase in production with improved effluent quality
- A potentially usable byproduct (about 200,000 ft^3/day of methane gas)
- A reduction in nutrient feed requirements
- Aerobic sludge generation less than one-tenth of that generated using aerobic digestion alone
- Anaerobic pilot plant data were transferable to a full-scale system
- Anaerobic system is easy to control (daily tests give necessary information to maintain an efficient cell)
- Substantial energy savings (aeration horsepower was reduced from 420 to 120; some aeration is still required for polishing and stabilizing)
- The anaerobic cell, with moderate changes, accommodates two to three times of present waste load. ☐

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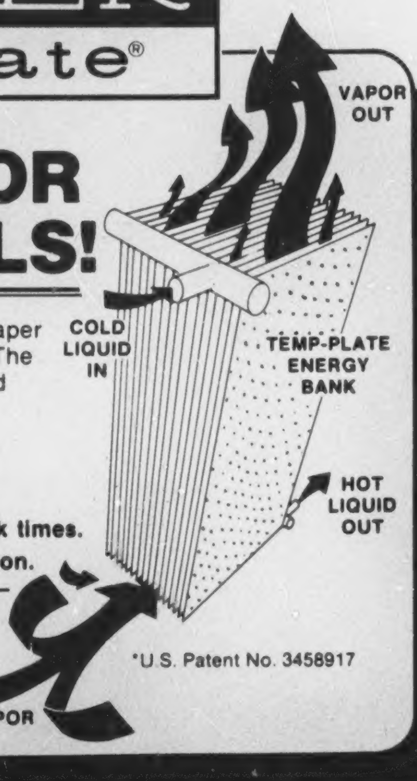


Red ink, slow rise in shipments on

Market pulp demand should head up in the U.S. and Far East, but European demand will remain weak; CTMP market pulp has potential for growth

By DAVID R. ALLAN, News Editor

☐ Tough sledding will continue to be the rule for the Canadian pulp and paper industry in 1983 despite the approach of an economic recovery in both Canada and the U.S., delegates to the recent annual meeting of the Canadian Pulp & Paper Assn. in Montreal were told.

Outgoing and incoming chairmen of the group painted a bleak picture in a press conference they held with association president **Howard Hart**. New CPPA chairman **John Fisher**, chairman of Fraser Inc., predicted that investment by the industry will drop by about 40% from the C$2.8 billion expended in 1982. He also cautioned executives to expect financial losses through the first three quarters of the year—with performance in the fourth period determining whether the industry is in the red for the year as a whole.

Retiring association chairman **Ray Pinard**, executive vice-president of Domtar Inc., warned that "if we are to continue our spending programs to improve productivity and competitiveness, we must search for some cost relief." That relief appears to be available only through a rollback in the 1983 portion of the 1982-83 wage pact signed with paperworkers last year, he added.

The industry will probably approach Canadian Paperworkers Union soon with an official request to reopen talks on the second year of the contract in order to slash the 10% wage hike now slated for 1983, Pinard said.

Some cost relief in fuel prices has been seen, and Pinard noted this trend led some Quebec mills to abandon plans to switch boilers from bunker fuel to natural gas.

Newsprint price outlook

But more important for the industry than reduced energy costs is the economic condition of its customers, and Pinard doesn't expect a major turnaround in current newsprint operating conditions until 1984. He does see a possible return of newsprint prices to US$500/metric ton from the current $468.50 level by the year's end, assuming a vigorous rebound in North American economies.

But that vigorous rebound is by no means certain in the minds of most speakers at the conference. CPPA woodpulp section manager **Brian McClay** gave one of the most optimistic presentations, saying that "I believe that the subdued recovery expected by many economic forecasting groups is unduly pessimistic."

But even McClay admitted that "it is a gross understatement to say that the signals coming from the U.S. Administration are confused." His general conclusion, however, is that "the U.S. economy is positioned to experience a more robust recovery than many dare predict."

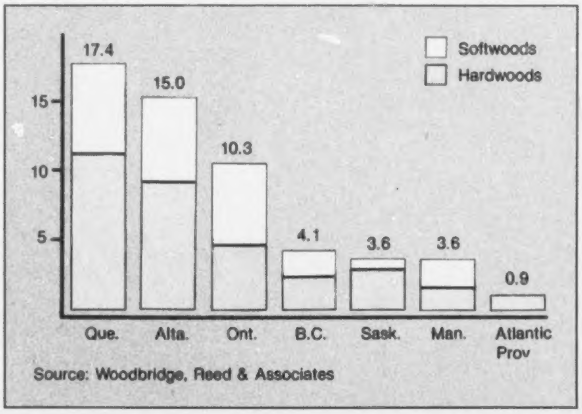
McClay and others believe the U.S. recovery will pull Canada out of its current economic doldrums. But Univ. of Toronto economist **Carl Beigie** suggested Canada cannot count on any of the four most popular engines to power its comeback: government stimulus, consumer spending, U.S. imports, and capital spending.

As a result, Beigie warned, "the economy . . . will recover, but extremely slowly," such that Canada's unemployment rate will end 1983 higher than it is now. That, in turn, will act to restrain consumer spending.

In looking at Canada's long-term competitiveness worldwide, Beigie suggested Canada let its dollar "drift" down now, before recovery is fully under way. A currency level that "makes sense" to him would be US$0.75 to the Canadian dollar.

Royal Bank of Canada economist **Stephen Prime** predicted the U.S.-Canadian exchange rate will remain relatively stable for the next two years, while the Japanese yen is appreciating against the two currencies. The Swiss franc and the deutsche mark will also prove strong, in contrast with the weak French franc, British pound, and Italian lira.

FIGURE 1: **Incremental fiber supply in Canada includes large volumes of hardwoods, especially in Quebec and Alberta** (million m³/year)



Source: Woodbridge, Reed & Associates

horizon for Canadian mills in 1983

Canadian economic performance

Canada's gross national product will rise about 0.5% in 1983, Prime believes, in contrast with a growth rate more than four times as high in the U.S. On the other hand, Canada's three-month commercial paper rates will drop below 8% by year's end, from 10.2% in January and 16.5% in early 1982. Corporate profits in Canada will shoot up by 40%, although from depressed levels, while the GNP price index will drop to 7.4% in 1983 and 5.8% in 1984, from 10.6% in 1982. U.S. housing starts will reach 1.3 million units in 1983 and 1.6 million in 1984, while Canadian starts climb to 160,00 and 185,000, respectively.

If that kind of recovery can be sustained, McClay thinks U.S. paper demand will rise somewhat faster than GNP. He expects a rise in Canadian pulp shipments to the U.S. of 12%, with some inventory rebuilding at paper mills possible in the second quarter.

On the other hand, Western European paper and paperboard output probably won't rise significantly until as late as the fourth quarter. Pulp inventory rebuilding will help push Canadian shipments to Europe up slightly, while a fall in oil prices would improve the overall picture on the continent.

Canadian shipments to Japan. A slight increase in Canadian pulp shipments to Japan is possible in the first half, increasing "considerably" in the second half as the yen appreciates in value. On the other hand, shipments to most of the Third World should remain static, dropping by mid-year and picking up after that.

Without a big recovery in any of its customer countries, Canada is likely to see a market pulp shipment rise of just 10%, from depressed levels, with operating rates "unlikely to cross the 80% level until the third quarter."

The picture in the European market may be even bleaker—at least in the long term—if purchasing director **Michael Gadd** of Britain's Reed Paper & Board Ltd. is right. Gadd described Western Europe's challenge as being one of "how we profitably manage overcapacity."

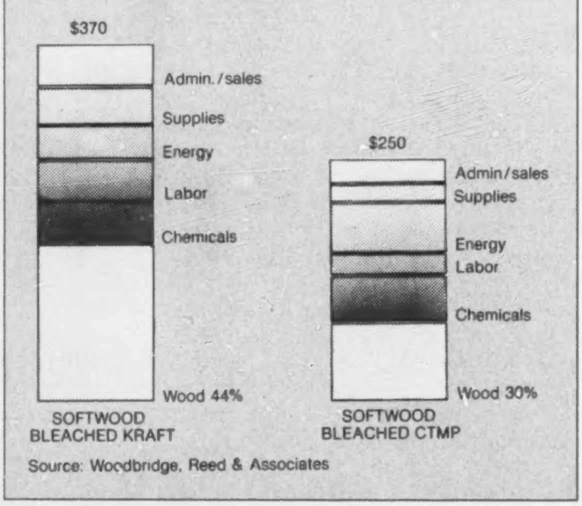
European paper capacity is expected to rise by about 8% by 1986, Gadd noted, adding, "we start the period already with excess capacity." The region is now underconsuming its paper and board capacity by almost 20%, and that—on top of an 8% capacity increase—spells trouble for the industry in the late 1980s and beyond.

Warning on European competition

While capacity is rising, Gadd predicts that "we are not expecting to see any major rise in demand for paper and pulp," adding that "there should be no more major investment in capacity for the immediate future if the rest of us are to survive."

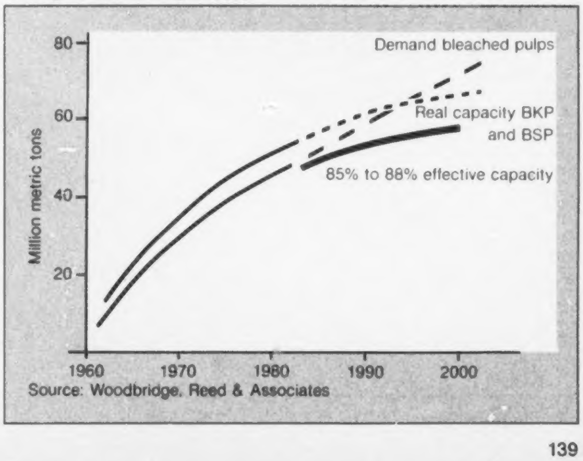
Complicating the picture is the current market situation, including the recent depreciation of Scandinavian currencies. And with European Community tariffs on Scandinavian pulp and paper shipments disappearing at

FIGURE 2: **Estimated production costs for a bleached softwood CTMP mill are only about two thirds of costs for a similar kraft pulp mill** (1982 U.S. $/a.d. metric tons)



Source: Woodbridge, Reed & Associates

FIGURE 3: **Demand for bleached pulps worldwide is projected to begin outrunning supply in the 1990s**



Source: Woodbridge, Reed & Associates

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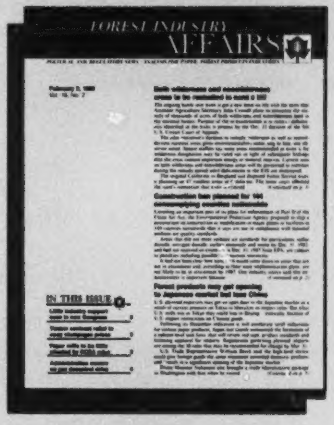

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the end of this year, any "cutthroat competition" on the part of Scandinavian mills or others could cause the EC to rebuild those tariff walls, he noted—muddying the waters in the future.

CTMP's market pulp potential

Recent technological advances have made chemithermomechanical pulp (CTMP) a potential replacement for bleached kraft pulp in integrated mills and as market pulp, and up to 15 CTMP mills could economically be built under present conditions in Canada alone, according to a study presented to the meeting by **Peter Woodbridge** of Woodbridge, Reed & Associates, Vancouver, B.C. The report was prepared for Environment Canada.

Readily accessible timber reserves and underutilized chip supplies make room for 13 such mills in western Canada and 2 more in central Canada, with potential for another 11 and 4, respectively, over the longer term once improvements in transport and power systems are made, the report concludes.

Nonintegrated printing/writing paper and tissue mills in the northern U.S. are among the most important potential customers for market CTMP, according to the report, with western Europe, Japan and South Korea also attractive possible markets.

South Korean demand. In the Japanese market, for example, Woodbridge predicts that imports of "high-quality, high-yield pulps" such as bleached CTMP could rise to 250,000 metric tpy, from 85,000 tons in 1980. In South Korea, demand for such pulps should hit 115,000 metric tpy in 1985 and 270,000 tpy in 1990—most of which will have to be imported.

Market CTMP mills would have to approach their customers in a different way from that of market kraft pulp mills, he notes, with the technical advantages of the pulp for a particular paper mill's needs the major selling advantage. Thus, marketing would be on a "technical" rather than a commodity basis. He adds, "the pricing of these pulps will be somewhat dependent on end-use."

Woodbridge estimates that bleached CTMP sold in the northeastern U.S. should be priced US$50/metric ton below that of southern hardwood bleached kraft pulp, while in Asia the price would have to be 75% to 80% of softwood bleached kraft and $50/metric ton less than hardwood BKP.

CTMP mill startup cost. Such price advantages are facilitated by the lower cost of a CTMP mill, the study notes, with total investment required at startup for a 550-metric-tpd bleached CTMP mill set at about C$140 million, well below costs for a comparably sized kraft pulp mill.

Production costs for such a mill in 1982 would have been about US$250/metric ton for softwood CTMP, compared with $370 for softwood BKP, Woodbridge estimates. With selling prices for bleached CTMP of C$580/metric ton, Woodbridge estimates a 20% to 23.5% return on equity for such a mill, depending on wood costs.

Good technical qualities are achievable with optimal use of present technology, the study claims, with 75% brightness or higher possible through peroxide bleaching. Yields for CTMP that are twice that of BKP reduces wood costs, he notes, while economically accessible timber reserves in Canada are much larger in the hardwood category than in softwood—and hardwood CTMP pulps can be used in production of high-quality printing/writing papers, the study claims. ☐

Aluminum sulfate markets continue to sag

By BARRY SHOCKETT

The first quarter of 1983 showed no significant increase in total demand for alum in the U.S. Pulp and paper usage had also not yet begun to rise. The expected economic recovery forecast for mid-year, however, could boost requirements for the full year.

With the exception of sewage treatment uses, alum markets in Canada have also remained sluggish. However, with the move by the city of Calgary to employ alum for phosphate removal, sparking the construction of a plant by United Chemicals, this end-use grew an estimated 10% in 1982.

ALUMINUM SULFATE

UNITED STATES

Uses: Aluminum sulfate is used by the pulp and paper industry for internal rosin sizing, pitch control, and water treatment. Nonpaper end uses include potable water and wastewater treatment.

Demand: Pulp and paper industry usage has been relatively unchanged for the last two years. An estimated 615,000 short tons were consumed in 1981 and 1982. The quantity employed for water and sewage treatment was also unchanged in those years, with usage at about 458,000 tons.

Sources: American Cyanamid Co., Allied Chemical, and Stauffer Chemical Co. account for 75% to 80% of industry capacity. There are about 15 producers. Allied Chemical is building a third plant in Florida, due onstream in mid-1983.

Availability: There are no shortages on the immediate horizon, and industry operating rates are below 50%. History: 1983 to 1979, market all years.

Pricing: Prices have remained constant since July 1981, although discounting is occurring in some areas. Pricing history: 1982, $133/ton, bulk, liquid (17% Al_2O_3), f.o.b. works, freight equalized; 1981, $121 to $133/ton; 1980, $101 to $109/ton; 1979, $89 to $94/ton.

U.S. statistics, 17% Al_2O_3 (000 short tons)

	1979	1980	1981	1982e
Nameplate capacity*	2400	2300	2500	2565
Production	1313	1182	1206.5	1200
Shipments	1216	1151	1205	1190
Imports	24	26.8	27	22
Exports	26.5	11.6	28	7
Apparent consumption	1213.5	1166	1204	1205

*Based on industry estimates of operating rates
Source: Bureau of Census, U.S. Dept. of Commerce

Canadian statistics, 17% Al_2O_3 (000 short tons)

	1979	1980	1981	1982e
Nameplate capacity	257	275.5	275.5	280.5
Production	193.5	198	196.5	193.5
Total demand	175.5	177.5	176.5	175
Internal paper sizing	53	54	52	49.5
Other pulp/paper	54	53	53	48.5
Municipal water sewage	51.5	53	54.5	60
Misc.*	17	17.5	17	17
Exports	22	22	23	21
Imports	4	1.5	3	2.5

*Including pigments

Forecast: Total alum demand is not expected to increase before mid-year, and could reach the 1.3-million-ton level in 1983. Usage by the pulp and paper industry could also increase by 7% to 8% for the full year. Based on raw materials cost, alum prices should increase in the second quarter. However, soft markets will probably mean a price hike will not occur much before late summer.

CANADA

Uses: The pulp and paper industry uses alum for rosin sizing, pitch control, process water treatment, and pH control. Other uses include municipal water treatment, sewage treatment, pigments, and synthetic crude production.

Demand: Pulp and paper industry alum usage is split evenly between rosin sizing and other uses, and the industry makes up 61% of total demand. In 1982, mill demand decreased to about 98,000 tons, down from 105,000 tons used in 1981. Internal rosin sizing consumed 49,500 tons in 1982 and 52,000 tons in 1981. Total demand in 1982 dropped to 175,000 tons, vs 176,500 tons in 1981.

Sources: Canada has 14 plants and 5 producers. Between 75% to 80% of total capacity is held by Alchem Smelters & Chemicals, and Allied Canada's Allied Chemicals Div. Next is Inland Chemicals (C-I-L subsidiary), then United Chemicals and Borden Chemicals.

Availability: No supply problems are foreseen through the end of the decade. History: 1983 to 1980: market; 1979: market to tight.

Pricing: There was one price change in 1982 (on Jan. 1) when bulk, liquid (70% equivalent Al_2O_3) rose to $131.54/ton, f.o.b., plant. A 6% boost had been announced for the beginning of 1983, but it was postponed for Apr. 1. Pricing history: 1983, $131.54 to $139.71/ton; 1982, $131.54/ton; 1981, $100.70 to $119.75/ton; 1980, $86 to $100.70/ton; 1979, $79 to $86/ton; 1978, $73/ton.

Forecast: Despite the 1982 drop in demand by the pulp and paper industry, usage should reach 119,000 tons by mid-decade. About 60,000 tons will be consumed by rosin sizing. If the expected second-quarter price hike holds, there will likely be no further boosts in 1983.

Mr. Shockett is consulting editor-chemical markets for PULP & PAPER.

PULP & PAPER

May 1983

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Hammermill's market pulp expansion at [illegible]

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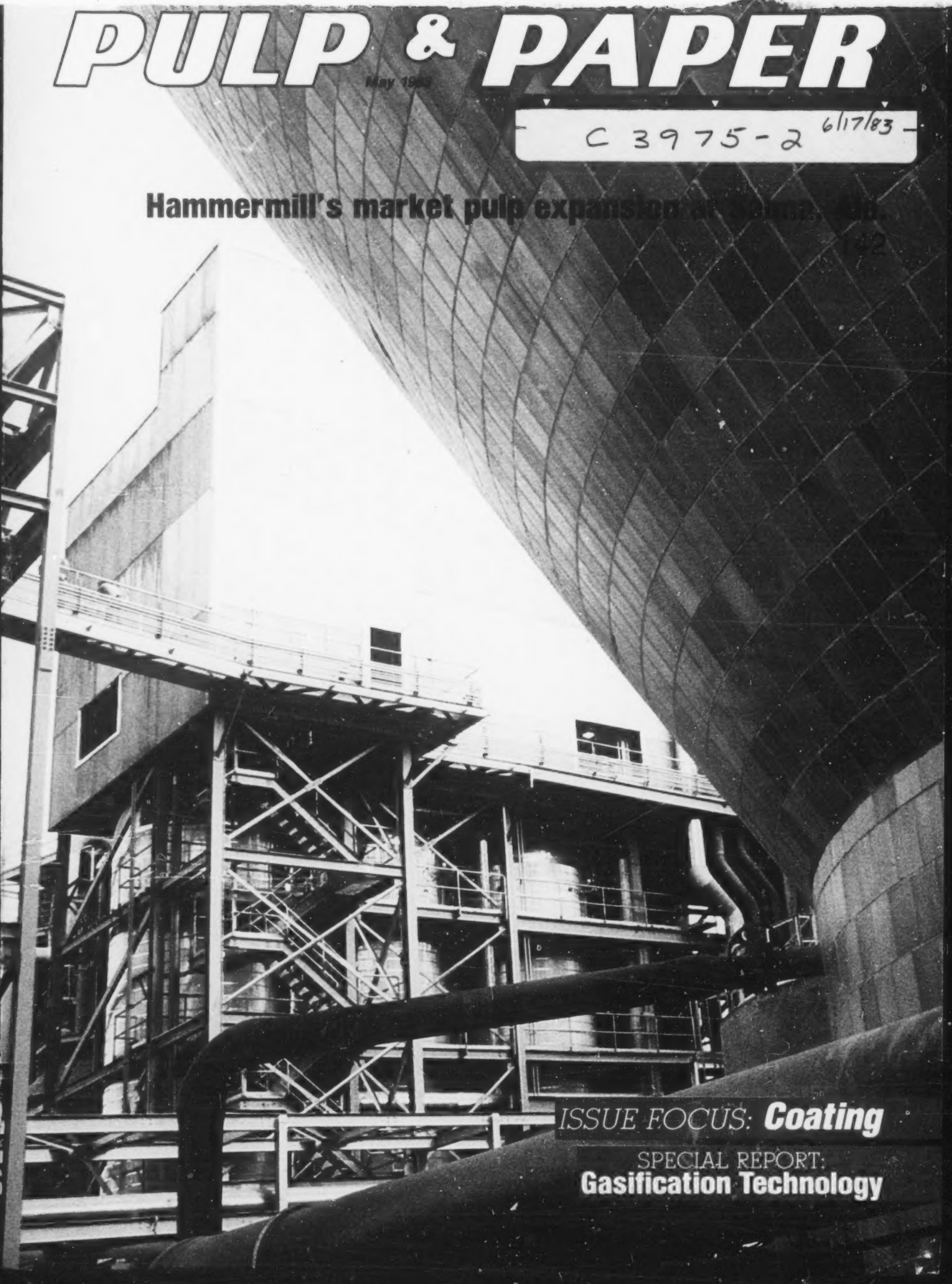

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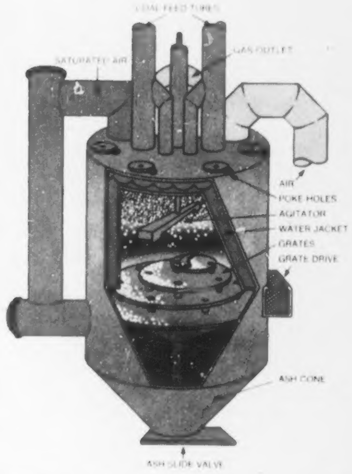

COAL GASIFICATION 118

COVER: Hammermill's recent expansions at Selma, Ala., include new high-density storage and batch digester capacity. Story begins on page 142. (Photo courtesy of Martin Public Relations Associates and Simons-Eastern, which is celebrating its 25th anniversary this year--see page 210).

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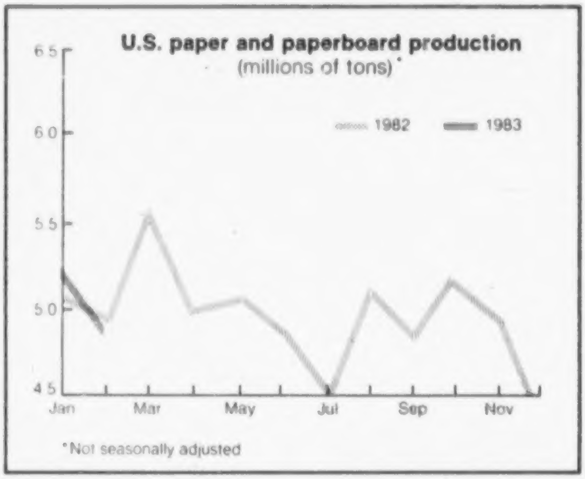
MONTH IN STATISTICS

U.S. paper and paperboard production in February totaled almost 4.9 million short tons, down 1% from February 1982 levels, according to the American Paper Institute. Adjusted for seasonal and workday factors, January-February production was at a rate of 62.6 million tpy, up 2.7% from the relatively high year-earlier rate, comparing favorably with the 62.3 million tons produced in the record-year 1981. Preliminary data for March indicate a flattening of the trend, with the adjusted annual rate holding at about 62 million tpy.

Among major grades, coated paper showed the largest gain, with production up 7.8% over last year. Also strong were uncoated free-sheet papers, up 4.2%, and tissue, up 7.5%. Except for semichemical medium, down slightly, paperboard grades were up 3% to 4% over February 1982. Output of kraft linerboard was sustained by relatively strong demand for exports.

Total Canadian newsprint shipments in February fell to 605,000 metric tons, down 11.5% from a year ago, according to the Canadian Pulp & Paper Assn. Newsprint mill operating rates were down to 85% from 95% last February. Woodpulp shipments totaled 490,000 metric tons, up 2.1% from year ago.



		Latest month (000 short tons)	% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION[1]					
Newsprint	February	417	0.2	5,166	−1.5
Uncoated groundwood (s)	February	109	—	1,349	1.9
Coated paper (s)	February	413	6.2	5,131	7.8
Uncoated free sheet (s)	February	628	−0.8	8,023	4.2
Unbleached kraft packaging and industrial (s)	February	307	−5.8	3,823	−0.3
Tissue	February	390	6.0	4,680	7.5
Total paper	**February**	**2,499**	**0.3**	**31,036**	**2.9**
Kraft linerboard, unbleached	February	1,104	−4.0	13,847	3.9
Semichemical medium	February	346	−2.5	4,367	−0.3
Bleached paperboard	February	306	1.0	3,787	3.2
Recycled paperboard	February	554	0.9	6,833	3.8
Total paperboard	**February**	**2,384**	**−2.4**	**29,766**	**2.4**
Total paper and paperboard*	**February**	**4,883**	**−1.0**	**60,801**	**2.7**
PULP, WASTEPAPER & FIBER[2]					
Total woodpulp production	January	4,247	4.6	50,969	4.5
Market pulp production	January	445	4.7	5,342	0.9
Wastepaper consumption at paper/board mills	January	1,177	−3.6	14,124	7.2
Pulpwood consumption (cords)	February	6,995	7.5	83,940	9.4
CONVERTED PRODUCTS STATISTICS[3]					
Corrugated box shipments (billion ft^2)	February	18.715	—	38.695†	3.2
Containerboard inventories at box plants	Feb. 1	2,486	−2.3		
INTERNATIONAL TRADE[2]					
U.S. paper imports (including products)	January	684	1.3	8,212	1.8
Imports of Canadian newsprint	January	540	−7.1	6,485†	−7.0
U.S. paper exports (including products)	January	349	12.9	4,189	13.1
Exports of unbleached kraft linerboard	February	155	−5.5	2,018	13.7
Exports of woodpulp	January	234	5.9	2,806	5.7
CANADIAN STATISTICS[4] (reported in metric tons)					
Total newsprint shipments	February	605	−13.1	1,209†	−11.5
Operating rates	February	84%	95%	82%	95%
Inventories held by U.S. consumers	Feb. 28	1,283	−21.4		
Woodpulp shipments (export only)	February	490	2.1	924†	−0.5
Operating rates	February	88%	91%	80%	86%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fiber Box Assn., Paperboard Packaging Council. 4. Canadian Pulp & Paper Assn.
*Includes construction and wet machine grades. †Not annualized. ‡Not directly comparable to year ago because of coding change. (s) = shipments.

Sale of CZ Canada now approved

British Columbia officials have approved the sale of Crown Zellerbach Canada Ltd. to Fletcher Challenge Ltd. of New Zealand. In the wake of earlier action by the federal Foreign Investment Review Agency and the Cabinet in Ottawa, the transaction was dependent only on the official signing ceremony in San Francisco.

In the $242-million deal, FC gets 84% of CZ Canada stock and is obligated to make an offering for publicly held shares (P&P, Feb., p. 27). The Canadian firm will apparently be operated as a separate subsidiary of FC, rather than being merged into FC subsidiary Tasman Pulp & Paper. CZ Canada president Thomas Rust said management was told it will stay on the job.

A stipulation in the agreement obligates FC to offer some of CZ Canada's stock to the public within seven years, Rust noted. The company would not say how much stock would be offered—but one security analyst estimated 40% to 49%.

Within the next year, a new name for the Vancouver, B.C.-based company must be found. The name cannot include any reference to the word "Zellerbach," a spokesman said, but those restrictions do not apply to the word "Crown."

CAPITAL SPENDING

Paper industry to boost '83 spending

U.S. pulp and paper companies are planning an ambitious increase in capital spending this year despite depressed profits, weak balance sheets, and relatively low operating rates for most grades. The latest Commerce Dept. survey conducted in January and February shows paper companies lifting outlays for new plant and equipment by 2.0% in 1983 to $6.09 billion, while the latest McGraw-Hill survey shows the industry boosting expenditures by 7.2% to $6.4 billion. This is up from actual spending of $5.97 billion last year which was 12.2% below the all-time peak of $6.80 billion reached in 1980.

This compares with a 1.7% decline in capital spending by all U.S. business in 1983, following a 1.6% decline in 1982—the first such back-to-back decline in postwar history, according to the Commerce Dept. Inflation for capital goods in 1983 is estimated at only 1.7%, indicating a real decline in spending for all U.S. business of 3.8% and relatively flat spending for the paper industry.

Spending is expected to reach a low of $5.74 billion in the first quarter, then rise to $5.74 billion in the second and average $6.51 billion, according to the Commerce Dept. data. If the economy begins to improve, a number of companies have indicated they might begin to scale up their "bare-bone" spending plans for 1983. Already Champion International decided to resume production on its $500-million hardwood market pulp mill for Michigan's Upper Peninsula (see p. 27).

Rush to get financing. A review of individual company spending plans shows that several companies with major mill projects under way—such as International Paper Co., Union Camp Corp., and Great Northern Nekoosa Corp.—plan sizable increases in capital spending this year. On average, the 14 companies shown in the accompanying table plan to boost outlays by 13.0%.

To finance their ambitious capital programs, paper companies have been turning heavily to external financing, either in the form of equity or longer-term debt to take advantage of surging stock prices and declining interest rates (see table). "Recent and prospective activity in financial markets is extensive, both to repair balance-sheet deterioration and to strengthen working capital and extend capital programs," notes analyst Bruce Kirk of Goldman Sachs.

Machinery orders. Because of weakness in 1982 order rates, shipments of U.S. paper machinery are expected to be relatively flat compared with last year's estimated level of $1.37 billion, according to Commerce Dept. New orders for paper machinery this year, however, should be up about 15%.

Exports of U.S. paper machinery in 1983 should jump 7% from their 1982 level of $316 million, which was down from a 1981 peak of $351 million, according to the department's new *1983 U.S. Industrial Outlook*. Imports should be stronger and surge 20% from their 1982 level of $225 million, which was down sharply from a 1981 peak of $273 million.

Capital spending plans of major U.S. pulp and paper companies for 1983 (millions of $)

Company	1983	1982	% change 1983/82
Boise Cascade	$150	$151	—
Crown Zellerbach	280	305	− 8.1
Federal Paper*	33	67	−51.1
Fort Howard	65	40	+62.5
GN Nekoosa	385	275	+40.0
Hammermill	70	170	−58.8
International Paper	760	469	+62.0
ITT Rayonier*	70	78	− 9.7
Kimberly-Clark	400	291	+37.5
Mead	127	137	− 7.3
St. Regis	142	286	−50.3
Southwest Forest	18	30	−41.9
Union Camp*	317	162	+95.7
Westvaco*	180	170	+ 5.9

*Preliminary data from P&P capital spending survey conducted in late 1982. Other statistics are from 1983 annual reports and recent company announcements.

External financing by U.S. paper companies in 1983

Equity	Value (millions of $)	Type of issue	Approximate date
Boise Cascade	$100	Conv. PS	1/83
James River	75	Common stock	1/83
GN Nekoosa	40	Conv. PS	2/83
Stone Container	36	Common stock	3/83
Weyerhaeuser	135*	Common stock	planned
Debt			
Georgia-Pacific	100	SF debentures	2/83
Kimberly-Clark	100	SF debentures	2/83
Southwest Forest	40	CS debentures	3/83
Westvaco	75	Debt (unspecified)	planned

*Estimated value based on current stock price. CS: convertible subordinated. PS: preferred stock. SF: sinking fund.

LABOR

Strikes settled at two IP mills

Striking members of the United Paperworkers International Union returned to work at International Paper Co.'s Vicksburg, Miss., mill on Mar. 22 after ratifying a new three-year agreement. Five days later, striking UPIU members at the company's Pineville, La., linerboard mill agreed to a three-year contract and also returned to work.

The contracts at both Vicksburg and Pineville call for wage increases of 7% the first year and 6% in each of the last two years. The pay figures are the same as rejected by the union at both mills prior to the Feb. 1 walkouts (P&P, Apr., p. 29). At the time, however, the company refused to make the increases retroactive to the Sept. 27, 1982 expiration date of the contract. In the new agreements, the company has agreed to a Nov. 1 retroactivity date, said an observer close to the negotiations.

- Striking members of the United Paperworkers International Union returned to work at **Simpson Paper Co.**'s 135-tpd fine papers mill in Miquon, Pa., on Mar. 7, after approving a new three-year labor contract a day earlier.

The new agreement, which expires Feb. 15, 1986, calls for wage increases of 7% the first year and 6% in each of the last two years. A dental plan was added in the second and third years and other benefits were improved, a union spokesman said. The strike began on Feb. 15 (P&P, Apr., p. 29).

- **Federal Paper Board Co.**'s folding carton converting plant in York, Pa., has been on strike since Mar. 5, when UPIU workers walked off the job after voting down an offer of 25c/5%/6% in a three-year agreement.

- At a February meeting, the UPIU increased strike benefits $10 to $55/week retroactive to January, according to a union newspaper. Officials said the move was intended "to show support for members facing concession demands at the bargaining table and difficult economic conditions which limit their options."

B.C. labor talks set for Apr. 29

Negotiations involving most of British Columbia's forest products industry were scheduled to begin on Apr. 29, a date set by the United Paperworkers International Union to present its demands to the Pulp & Paper Industrial Relations Bureau, bargaining agent for most pulp and paper companies in the province.

The wood products industry's agent, the Forest Industrial Relations Ltd., has not set a date to meet with the International Woodworkers of America negotiators, although IWA contracts expire on June 15, two weeks earlier than UPIU and Pulp & Paper Workers of Canada contracts expire.

The IWA, however, has drafted its goals. It is seeking a one-year contract with a "substantial" wage increase, as well as better job security and a cost-of-living clause, observers said. UPIU and PPWC will both be meeting separately the week of Apr. 18 to formulate their agendas. Unlike UPIU, however, PPWC has not set a date to meet with the PPIRB.

The forest products industry has taken the stand that it cannot afford to increase any costs in 1983, including wages, said a spokesman of the FIR and PPIRB. The agencies will be seeking a three-year agreement with no pay hike in the first year and "gradual improvements" in the second and third years, he noted.

"The industry is saying that in order to get back on its feet, to restore economic health, and provide the kind of stability that will keep people working, it needs a minimum three-year recovery period," he said.

EMPLOYMENT

Industry wages rose over 7% in 1982

Average hourly earnings of production workers in U.S. pulp and paper mills in December 1982 were 7.9% higher than in December 1981, but had dropped 0.9% from the September 1982 level, according to Bureau of Labor Statistics data. Weekly hours for December were 0.2% higher than a year earlier and unchanged from the September level. Overtime hours were the same in December for both years, but were 18.6% lower in December than in September 1982.

Production workers at paperboard container and box plants were earning 7.9% more per hour in December 1982 than in 1981, and 1.2% more in December than in September 1982. Weekly earnings were up 6.9% in the year-to-year period, and up 1.7% in December over September 1982.

Weekly hours dropped 1.0% in the year and rose 0.5% in the three months ending December 1982. Overtime hours worked were the same in December for both years, but dropped 11.8% in December vs September 1982.

Production worker employment in the paper and allied products industry was 483,200 in December 1982—a 4.5% decline from December 1981. Preliminary January 1983 data from BLS indicate a further 0.8% drop to 479,300 employees. The unemployment rate in the paper and allied products industry in January 1983 was 8.2% (61,000 unemployed), compared with 8.0% in 1982 (59,000 unemployed).

Average earnings and hours of production workers in the paper and allied products industry

	Dec. 1982	Sept. 1982	% change for quarter	Dec. 1981	% change year ago
Paper & allied (SIC 26)					
Hourly earnings	$9.65	$9.63	0.2%	$8.96	7.7%
Weekly hours	42.4	41.7	1.7	42.7	−0.7
Overtime hours	4.1	4.6	−10.9	4.2	−2.4
Weekly earnings	409.16	401.57	1.9	382.59	6.9
Pulp & paper mills*					
Hourly earnings	$11.28	$11.38	−0.9%	$10.46	7.9%
Weekly hours	44.5	44.5	—	44.4	0.2
Overtime hours	5.7	7.0	−18.6	5.7	—
Weekly earnings	501.96	506.41	−0.9	464.42	9.0
Paperboard containers & boxes					
Hourly earnings	$8.46	$8.36	1.2%	$7.84	7.9%
Weekly hours	40.9	40.7	0.5	41.3	−1.0
Overtime hours	3.6	3.4	−11.8	3.0	—
Weekly earnings	346.01	340.25	1.7	323.79	6.9

*Does not include figures for paperboard mills, which are similar.
Source: Dept. of Labor, Bureau of Labor Statistics

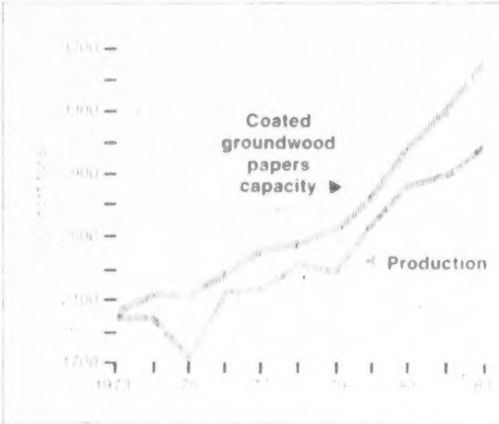
Coated groundwood papers: Demand improving, but market still glutted

Statistics	1981	1982	1983e
Production, 000 tons[1]	2,804	2,890	3,050
Capacity, 000 tons[2]	3,047	3,312	3,625
Utilization rates, %	92.0	87.3	84.1
Imports, 000 tons	35	70	55
Exports, 000 tons	46	36	41
Apparent U.S. consumption			
000 tons	2,620	2,924	3,064
lb/capita	23.54	25.24	24.63
000 tons/$ billion real GNP (1972)	1.77	1.93	2.07

e = estimated

[1] PULP & PAPER estimates

[2] API capacity for coated groundwood papers; includes coated grades No. 5 and some of No. 4



Estimated 1983 capacities of major U.S. companies are:

	Annual capacity (000 tons)	Capacity share (%)
1. St. Regis Paper Co.	543	15.0
2. International Paper Co.	450	12.4
3. Consolidated Papers Inc.	411	11.3
4. Crown Zellerbach Corp.	280	7.7
5. Boise Cascade Corp.	270	7.4
6. Blandin Paper Corp.	257	7.1
7. Mead Corp.	230	6.3
8. Midtec Paper Co.	223	6.1
9. Weyerhaeuser Corp.	175	4.8
10. Pentair Industries Inc.	175	4.8
11. Fraser Paper Ltd.	160	4.4
12. Bowater Inc. (Bowater Carolina)	125	3.4

U.S. No. 5 capacity (1983): **3.625 million tons**
Capacity share of top five companies: 53.9%
Capacity share of top ten companies: 83.1%

Grade structure: Coated groundwood publication paper consists of furnish having at least 10% mechanical pulp, with the rest consisting of chemical pulp. It includes mostly No. 5 paper, with some No. 4 paper, both of which are coated on two sides. No. 5 paper has lower basis weight than No. 4, while No. 4 is of higher quality and brightness than No. 5. Basis weights usually range from 32 lb to 70 lb (25 × 38 in—500). End-uses include offset, rotogravure and letterpress printing. In the case of lightweight coated (LWC) paper, coat weight can represent up to 30% of total sheet weight.

Production/capacity: Production growth of about 3% in 1982 slowed considerably from advances in previous years, according to PULP & PAPER estimates (American Paper Institute does not release production figures for coated groundwood). During the same period, three new machines came online, adding 543,000 tpy of capacity. This follows a rise of 11.5% in capacity in 1981. Between 1981 and 1986, capacity is expected to expand 33%, according to API figures.

Outlook: Markets for coated groundwood papers are expected to improve slightly in 1983, as advertising picks up in magazines in response to a parallel growth in the economy. Catalog and direct mail users will also be increasing their consumption in line with improvements in consumer spending.

The market should also gain from increased use of coated groundwood for newspaper inserts and other advertising pieces. Despite a hefty 13% advance in the market early this year, though, average annual growth rates for 1983 are expected to be in the area of just 5% to 7%, observers say. Operating rates should also remain depressed at about 89%.

Prices: Prices stagnated in 1982 and actual transaction quotes began eroding early in 1983. Some observers expected that increases might be put through later in the year, depending on the speed with which the market strengthens. Typical pricing trends ($/short ton) are, for 34-lb paper: 1973, 285; 1974, 400; 1975, 385; 1976, 460; 1977, 500; 1978, 570; 1979, 637; 1980, 673; 1981, 735; 1982, 760; 1983, 760.

Markets: About 64% of No. 5 goes into magazines, with commercial printing taking another 22%, and catalogs accounting for 17%.

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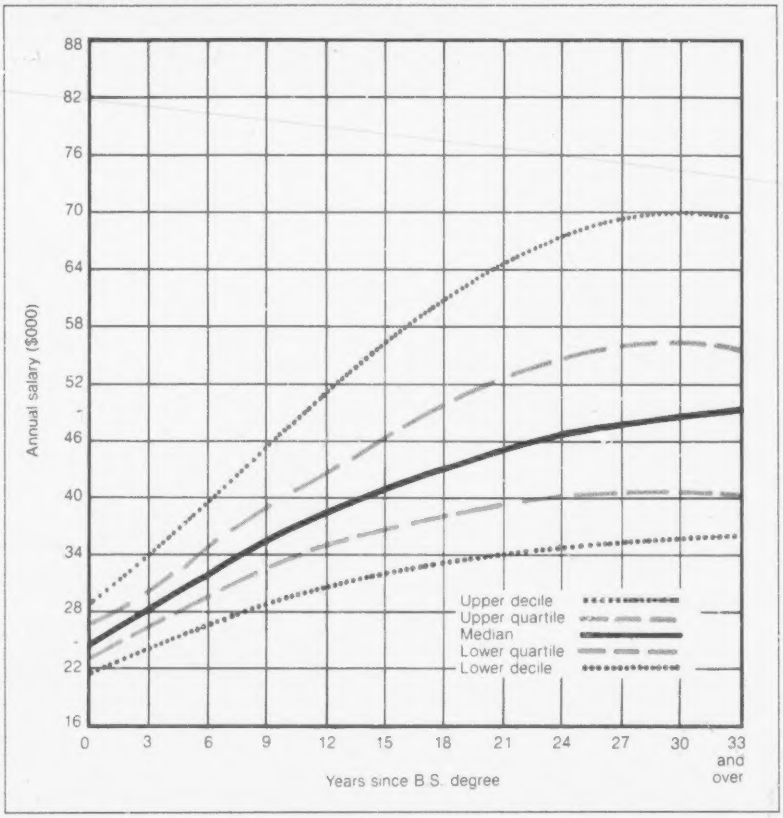
FIGURE 1: **Annual salary of engineers in the paper and wood products industries since B.S. degree, 1982**



Paper industry engineers'

By SYBILLA A. SUDA, Staff Editor

TABLE 1: **Engineers' median salaries by group**

Industry	**1982 salary**	**1981 salary**	**% change**
Petroleum	$41,850	39,200	6.8%
R&D	39,100	36,050	8.5
Chemicals	38,750	35,400	9.5
Mining	37,300	n.a.	n.a.
Paper	**36,100**	**32,800**	**10.1**
Electronic equipment	34,600	n.a.	n.a.
Mechanical equipment	34,600	31,400	10.2
Aerospace	33,900	31,550	7.5
Design, consulting & engineering	33,750	29,300	15.2
Local government	33,150	28,150	17.8
Metals	31,600	28,900	9.3
Electrical equipment	31,300	n.a.	n.a.
Construction	30,700	n.a.	n.a.
Federal government	30,000	31,600	−5.1
State government	28,150	26,700	5.4
Average	**34,320**	**31,880**	**7.7**

Source: Engineering Manpower Commission.

Complete salary data are published in *Professional Income of Engineers—1982*, which can be purchased for $35 from the Engineering Manpower Commission of American Assn. of Engineering Societies, 345 East 47th St., New York, N.Y. 10017.

☐ Engineers in the paper industry were paid a median salary of $36,100 in 1982, up a hefty 10.1% over 1981 salaries and well above the 7.7% rise in the consumer price index from February 1981 to February 1982. Paper industry engineers were paid more than the average for 15 major industry groups—an estimated $34,320, according to the Engineering Manpower Commission of the American Assn. of Engineering Societies.

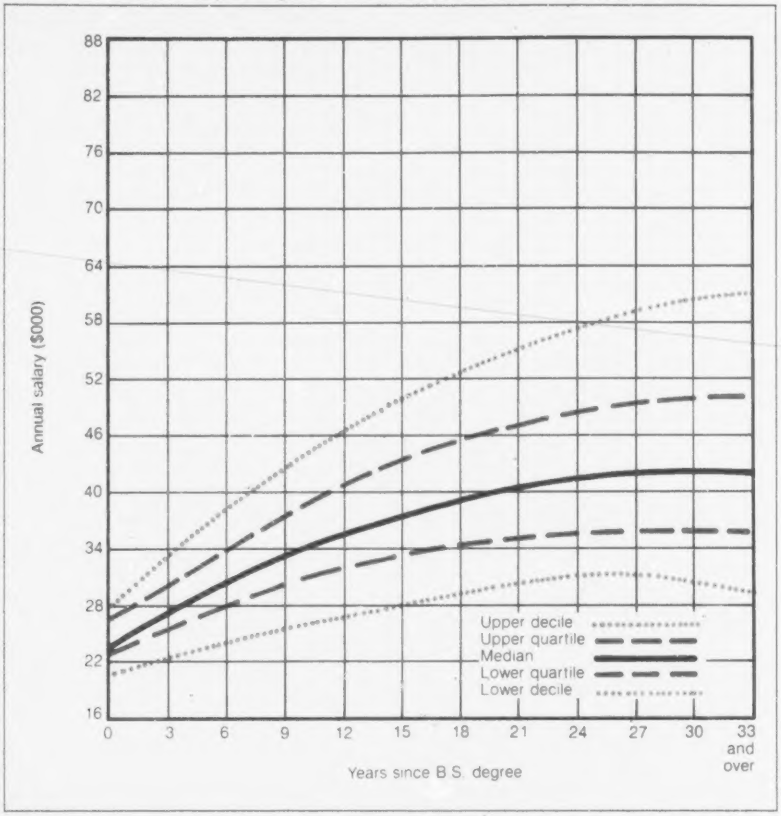
The commission's report, which is published on a yearly basis, surveyed companies, agencies, and other establishments representing over 135,000 engineers. Results of the survey are based on data gathered between February and May 1982.

Salary figures refer to base salaries before deductions and allowances, including a cost-of-living differential, if any. Not included are unpredictable payments for overtime work, stock options, and the like.

Paper industry engineers ranked fifth in median salaries paid in 1982, exceeding their 1981 ranking position (see Table 1). The 10.1% rise in salaries of paper industry engineers was one of the higher increases among industries, and was well above the average salary increase of 7.7%.

Compared with the 1981 survey conducted by the commission, the current survey shows salaries of newly employed engineers in the paper industry rose about 15.2% in 1982 over 1981, to a median starting salary of

FIGURE 2: **Annual salary of engineers in all industries since B.S. degree, 1982**



salaries in 1982 up 10% from 1981

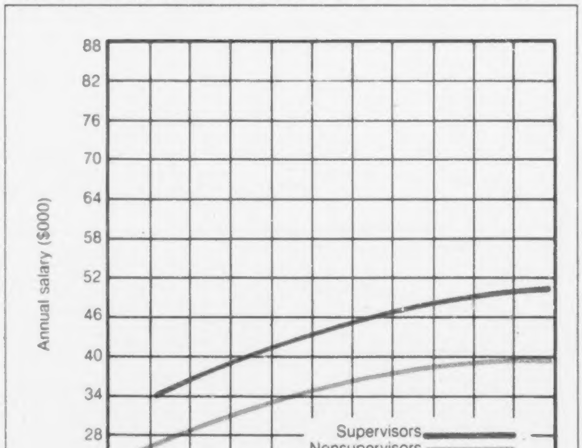
$25,000 and a high of $28,100. This range encompasses an actual decline for engineers working for the federal government, who ranked seventh in the previous survey, to the 15.2% rise for those in design, consulting and engineering, who ranked eleventh in the 1981 survey.

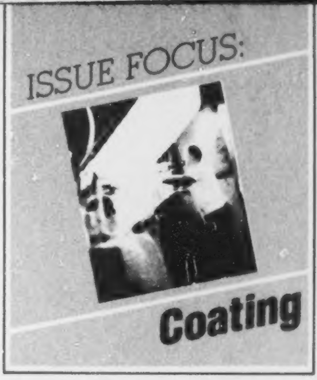
Salaries of all types of engineers in the paper industry are shown in Figure 1, which plots annual salary against the number of years after receiving a bachelor of science degree. For comparison, annual salaries of all industry engineers are plotted in Figure 2. Salaries of experienced engineers in the paper industry are up nearly 8% over 1980, according to the survey.

On a regional basis, salaries of all engineers in the west-south-central and Pacific regions were highest, followed by those in the mid-Atlantic and (east) north-central regions of the country.

Differences in salary exist for many reasons other than years of experience, and these factors must also be taken into account when comparing salaries. For example, data on all engineering categories show that engineers in supervisory positions earned considerably more than those who were in nonsupervisory positions. In the paper industry, salaries paid to all supervisory engineers average out to $46,400, up 12.5% over 1981, while salaries paid to nonsupervisory engineers average out to $30,100, down 1.3%, according to the survey (see Figure 3). □

FIGURE 3: **Median salaries of supervisory vs nonsupervisory engineers in the paper and wood products industries, 1982**





Coating, filler pigments: prices competitive, discounts common

P & P's annual survey reports pigments are generally available; demand has remained good. Overcapacity, competitive pricing remain in many grades

PULP & PAPER STAFF REPORT

☐ PULP & PAPER's exclusive annual survey of the availability and prices of paper coating and filler pigments found producers in the midst of what is generally viewed as a "holding pattern." Although paper industry use held up surprisingly well in 1982 and most expect 1983 to be a similar and better year in terms of paper industry demand, overall demand and profits are down. Other nonpaper sectors had an off-year in 1982, and in general pricing has remained weak, which has continued to place many producers in a price/cost squeeze. In particular, the severely depressed housing and steel industries have significantly affected overall consumption of many pigments, including titanium dioxide, kaolin, etc.

The roughly 1.0 million housing starts in 1982, depressed auto sales, and overall weak steel markets resulted in reduced demand for pigments in paint and coverings, and for refractory clays. Data from the U.S. Bureau of Mines show that an estimated 6.33 million short tons of kaolin were produced in 1982 vs 7.983 million short tons in 1981—the lowest overall level since 1977. Georgia increased its share of this smaller market to about 84% of total U.S. kaolin production. Exports also eased, reflecting the depressed world economy. This drop in demand, combined with the expansions completed in 1980-82, lowered operating rates to the 60% range.

Kaolin producers who are mainly integrated into paper industry product lines fared much better in general than overall production data indicated. The major paper industry consumers of kaolin, coated paper, and uncoated printing/writing papers performed better than the industry as a whole. Coated paper shipments rose a modest 1.8% in 1982 to 5.03 million short tons, vs 4.94 million short tons in 1981. Uncoated free-sheet grades did not do quite as well, but production remained basically static at 7.86 million short tons, a 0.4% drop from 7.89 million tons in 1981. Coated boxboard and other grades consuming coating and filler pigments generally showed a drop in 1982 production. Demand for these pigments in 1983 is forecast to be up a modest 5%, with printing/writing papers expected to perform better as business activity improves.

Kaolin clay

Kaolin clay on a tonnage basis is by far the major pigment used by the paper industry in coating and filler applications. Overall industry demand held up well in 1982, and preliminary estimates are that a total of about 3.4 million short tons were used domestically in coating and filler end-uses. Most producers indicated that their 1982 shipments were on par with 1981 levels, with at least one indicating that shipments were up about 8% last year.

As reported in last year's survey (P&P, May 1982, pp. 119-121), the combination of uncertainty concerning the performance of the economy, steady demand combined with expanded capacity, and relatively weak paper prices resulted in an intensely competitive pricing situation. Many producers reported that list prices were basically meaningless, discounting prevalent, and transaction prices were in some cases at 1980 levels.

The situation as reported this year is largely unchanged, although a variety of list prices were reported. One producer noted that list prices up and down his product line were unchanged and that actual transaction prices are very similar to last year. Other producers raised list prices incrementally (2% to 5%), but actual prices mills pay are very close to last year's levels.

Generally, the outlook for kaolin prices in 1983 is very conservative. As one producer noted, "List prices will be difficult to raise and any actual increases that occur will merely reflect the elimination of the current substantial discounting." Most producers who felt relatively optimistic about 1983 forecast somewhat moderate increases in the 5% to 8% range.

However, there were some producers who felt that no increases are likely, especially in light of the fact that the current excess in coated paper capacity will keep operating rates depressed and pricing weak for these paper grades. Increases will be difficult to pass on to the mills until their balance sheets improve. The recent drop in energy prices will aid both kaolin producers and mills in increasing or at least sustaining their margins.

Anhydrous kaolin prices reportedly rose 5.8% to $365/ton following an 11.3% increase in 1982. High-brightness No. 1 grades increased generally in the 6% range although, as mentioned, not all producers raised lists, and actual transaction prices vary.

All grades of kaolin, including premium pigments (anhydrous, high-brightness No. 1, delaminated grades); commodity coating clays (such as Nos. 1 and 2 clays); and filler clays (both water-washed and air-floated); are reported to be readily available. The tightness in certain premium and filler clays reported a few years ago has disappeared following the round of expansion projects most producers have completed.

Several producers have installed spray dryers and magnetic separators to alleviate the shortages that recently occurred in these grades. Calcined clay facilities are being expanded also (e.g., J.M. Huber Corp.) to supply calcined extender pigments to replace titanium dioxide. The current excess capacity situation seems to ensure that kaolin supplies in particular will be adequate in the forseeable future.

Titanium dioxide

Producers report both rutile and anatase grades are generally in good supply, reflecting continual weakness in protective coatings markets such as paint for houses and autos. Recently the stronger performance of the paper industry, relative to other titanium dioxide end-use markets, has shifted paper's market share slightly up from the low-20s to the mid-20s. This is the second-largest outlet for this pigment, after the roughly 42% to 44% market held by paints, varnishes, and lacquers.

Most producers believe that prices have stabilized at their current discounted price levels, and demand is expected to improve in 1983 as auto and housing markets rebound. There are reports that actual transaction prices for anatase are as low as $0.61/lb and $0.66 for rutile.

Inventories are reported to be low, ensuring that a pickup in demand will materialize as an increase in production and firming in price. Low titanium dioxide industry operating rates continue to plague producers, with only about 60% to 65% of capacity being utilized. Some producers noted that imports have recently affected domestic producers and contributed to the aggressive pricing and supply/demand imbalance. This is due to excess capacity in Europe and the strong U.S. dollar. List prices for anatase grades is $0.69/lb, with some producers offering slurry and dry product at this price and others placing a $0.01/lb premium on dry pigment. Rutile lists were reported to be $0.75/lb.

Calcium carbonate

Calcium carbonate ($CaCO_3$) demand by the paper industry was similar to 1981, most sources noted Both ground grades and precipitated calcium carbonate are reported in good supply. One supplier noted that paper industry demand for finer particle ground calcium carbonate continued to increase due to the surge in lightweight coated capacity.

Overall business did not perform as well, as paint markets continued to be depressed. Housing starts in 1982 were at the 1.0-million-unit level, but most producers felt that an improved economy in 1983 would raise starts to 1.5 million units. The outlook for $CaCO_3$ in filler applications appears promising, with some large paper machines that have recently come onstream reportedly running alkaline systems.

Plastic and inorganic pigments

Plastic pigments used by the paper industry are reported to be in good supply, and prices have not increased since last year, remaining at $0.75/lb.

The price of urea formaldehyde pigments rose 8.7% since last year's survey to $1.15/lb for paper industry grades. The price of silica-silicates pigments rose an average of 7.8%. PPG Industries will discontinue producing its Hi-Sil 404 extender pigment in September. ☐

TABLE 1: **Prices and availability of commonly used pigments for coating and filler applications**

	Availability[1]		Price quotations ($)[2]		Year-to-year
	1982	**1983**	**March '82**	**March '83**	**Increase** (%)
Calcium carbonate					
Ground natural, medium, ton dry	Market	Market	91-110[3]	98-125	10.9
Precipitated, bag, ton[4]	Market	Market to tight	44-200	155-218	8.4
Hydrated alumina, slurry, ton	Market	Market	365	365	0
Kaolin, clay, ton[5]					
Anhydrous kaolin	Market	Market	345	365	5.8
High brightness, No. 1	Market	Market	133-144	144-154	7.6
Delaminated, standard grades	Market	Market	88-115	96-134	13.3
No. 1 coating	Market	Market	84-106	88-107	2.6
No. 2 coating	Market	Market	66-86	70-84	1.3
No. 3 coating	Market	Market	64-77	68-81	5.7
Filler,					
Water-washed	Market	Market	51-62	51-66	3.5
Air-floated	Market	Market	30-40	31-40	1.4
Plastic pigments, lb	Market	Market	0.75	0.75	0
Satin white, 100 lb, drum 37% solids	Market	Market	12.00	12.00	0
Silica-silicates, ton	Market	Market	520-535[6]	530-620	9
Talc, bag, ton	Market	Market	158-174	169-189	7.8
Titanium dioxide					
Anatase, lb, dry	Market	Market	0.69-0.73	0.69-0.73	0
Anatase, lb, slurry	Market	Market	0.60-0.70	0.69-0.70	0
Rutile, lb, dry	Market	Market	0.75-0.80	0.75-0.77	0
Urea-formaldehyde, lb	Market	Market	1.15[7]	1.25	8.7
Zinc oxide, lb	Market	Market	0.5275-0.5475[8]	0.5025	−6.5

1. Availability terms are defined as follows: Very tight—on allocation or demand significantly higher than supply; Tight—demand slightly greater than supply; Market—supply and demand in balance or excess capacity available.
2. Prices are based on quotations for bulk f.o.b. plant shipments, except where noted, but do not necessarily represent the range in prices listed by all producers.
3. Higher-quality ultrafine and fine-ground calcium carbonate grades are available at $20-$40/ton more than the highest price.
4. Bulk shipments are $32-$45/ton lower.
5. Slurry shipments of kaolin clays are $6/ton lower on a dry basis. Shipment in 50-lb bags usually commands a premium of $20-$22 over bulk prices.
6. Silica-silicates having lower brightness and larger average particle size are available for $20-$35/ton less than the quoted prices.
7. Urea formaldehyde pigment having finer average particle size is available at $0.40/lb more than the quoted price.
8. Price per lb truckload quantities, add 0.05 less than truckload quantities.

Wastewood gasification economical

Cost of refitting an oil/natural gas-fired boiler for hog fuel/wastewood burning makes user gas produced at the mill an economically attractive option

By RICHARD W. HELM

□ The economic feasibility of a proposed wood gasification facility rests primarily on the cost and quality of available wood feedstock, financial parameters, and the cost of conventional fuels. Other important factors include type of gasifier selected, the degree of sophistication incorporated into the gasification plant, size of the proposed plant, type of end-user application considered, and local environmental regulations. A site- and application-specific study is, therefore, recommended to accurately evaluate the economics of a proposed wood gasification facility.

Types of gasifiers

Two basic types of wood gasifiers are currently available: the fixed bed and the fluidized bed. The fixed bed, is available in three different versions: updraft, downdraft, and cross draft.

A brief list of gasifier developers and manufacturers for fixed and fluidized gasifiers is shown in Table 1.

A typical fluidized bed gasifier is shown in Figure 1. Fluidized beds usually contain an inert material (such as sand) along with wood char and ash which are held in suspension (simulating a "fluid") by a rising column of gas. The solids are subjected to rapid agitation and mixing, resulting in high heat and mass transfer throughout the bed. As a result, the wood residence time is comparably shorter for a fluidized bed than for a fixed bed. Single fluidized bed units can be built in the 80- to 100-million Btu/hour range because of the relatively high throughput.

Both fluidized bed and fixed bed wood gasifiers operate at pressures slightly above atmospheric pressure, usually in the 1- to 5-psi range.

Gasification feedstocks

Large quantities of logging and mill residues are available in the U.S. Logging residue is generated primarily as a result of timber harvesting. Mill residue is generated mainly from barking and wood product processing. Currently, the time and expense for collection, transportation, and processing of logging residue for use as a gasifier feedstock may be prohibitively high due to the scattered distribution and remote location from potential users.

Mill residues occur in a large variety of forms (slabs, edging, sawdust, planer shavings, sander dust, ends, veneer and plywood trimmings, cores, defective products, etc.). Current uses for mill residues are dominated by the use of the coarse wood fraction for pulp manufacture. An additional fraction of the wood residue is used for raising process steam and/or electric power generation.

Mill residue is often further processed to reduce its size for easy handling. The reduced size mill residue is often called hog fuel.

The type of wood feedstock available for a proposed gasification application will have a direct impact on the type of gasifier selected (fluidized bed or fixed bed). Hog fuels with a wide size distribution from woodchips to sawdust are best suited for fluidized beds. A biomass densification process producing briquets or pellets from a sawdust feedstock can be considered to prepare a suitable feedstock for a fixed bed gasifier.

TABLE 1: **Wood gasifier developers and manufacturers**

Fixed bed
Updraft (countercurrent)
  Applied Engineering Co., Orangeburg, S.C.
  Halcyon Associates Inc., East Andover, N.H.
Downdraft (co-current)
  Biomas Corp., Yuba City, Calif.
  Duvant Co., Valenciennes, France
  Imbert Energie Technik, GmbH, Weilerswist, W. Germany
  Pillard Co., Marseille, France

Fluidized bed
Alberta Industrial Dev., Edmonton, Alta.
B.C. Research, Vancouver, B.C.
Energy Products of Idaho (EPI), Coeur d'Alene, Idaho
Energy Resources Co. (ERCO), Cambridge, Mass.
Omnifuel Gasification Systems Ltd., Toronto, Ont.
Weyerhaeuser Co., Tacoma, Wash.

Mr. Helm is senior process engineer, Gilbert/Commonwealth Inc., Reading, Pa.

alternative to burning solid wood

The moisture content of the available wood feedstock will have a direct effect on the gasifier thermal efficiency and product gas heating value. Fluidized bed gasifiers can handle wood feedstocks with moisture contents in excess of 50%, but the product gas heat duty (gas heating value plus sensible heat) will be less than 100 Btu/scf. Seasoned wood feedstocks with a moisture content of 30% by weight or less are preferred for both fluidized bed and fixed bed gasifiers. A front-end wood drying unit should be considered if the available wood moisture content is too high.

The cost of wood feedstocks for a planned gasification facility will depend on the location of the plant site and the availability of wood feedstocks in that general vicinity. Assuming an abundant supply of wood residues or hog wood in the general plant vicinity, the cost of hog fuels will most likely range from about $7 to $25/ton (b.d.).

Wood vs coal properties

Gasification of coal has received considerable attention by government and industry in the U.S. since the early 1970s. Some of the positive and negative character-

FIGURE 1: **Schematic diagram of a fluidized bed gasifier**

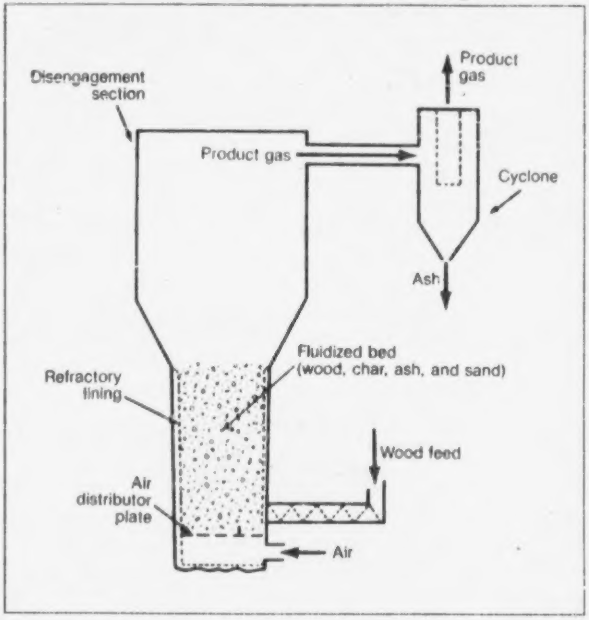

Disengagement section
Product gas
Product gas
Cyclone
Ash
Fluidized bed (wood, char, ash, and sand)
Refractory lining
Wood feed
Air distributor plate
Air

FIGURE 2: **Rotary kiln schematic diagram**

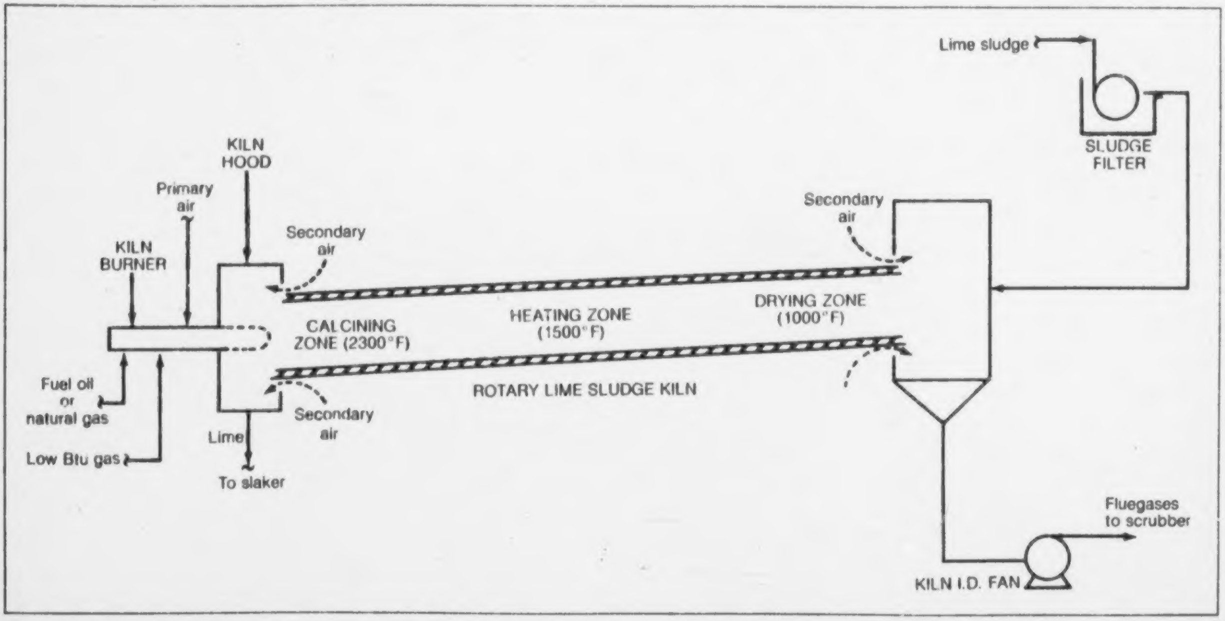

Lime sludge
SLUDGE FILTER
KILN HOOD
Primary air
KILN BURNER
Secondary air
Secondary air
CALCINING ZONE (2300°F)
HEATING ZONE (1500°F)
DRYING ZONE (1000°F)
ROTARY LIME SLUDGE KILN
Fuel oil or natural gas
Low Btu gas
Lime
Secondary air
To slaker
Fluegases to scrubber
KILN I.D. FAN

TABLE 2: **Woodfuel characteristics compared to coal**

Positive woodfuel characteristics relative to coal
High volatile content
Low ash content
Low sulfur content

Negative woodfuel characteristics relative to coal
High moisture content
Low bulk density
Irregular size distribution

TABLE 3: **Comparison of fuel combustion characteristics**

Analysis (%)[1]	**Natural gas**	**No. 6 fuel oil**	**Low-Btu[2] wood gas**
C	—	85.5	—
CO	—	—	19.3
H_2	—	11.5	19.0
CH_4	99.0	—	—
C_2H_6	0.2	—	—
CO_2	0.2	—	9.5
N_2	0.6	—	40.8
S	—	3.0	—
H_2O	—	—	11.4
Total	**100.0**	**100.0**	**100.0**
Volume ratios			
Combustion air/fuel, input, scf/scf, scf/lb)	9.47(222.4)	(181.6)	0.91(14.7)
Fuel-air mix/fuel input HHV, scf/million Btu	10,406	—	12,417
Fluegas/fuel input HHV, scf/million Btu	10,482	10,427	11,150
HHV			
Btu/scf fuel gas	1,006(23,624)	(18,470)	154(2,497)[3]
Btu/scf air-fuel mix	96.1	—	80.5
Btu/scf fluegas	95.4	95.9	89.7

1 Volume (%) for fuel gas and natural gas; weight (%) for oil
2. Hot low-Btu gas from fluidized bed wood gasifier, 20% moisture content wood, gas temperature is 1,500°F
3. Includes sensible heat to 1,500°F

istics of woodfuel as compared to coal (which affect gasifier selection) are summarized in Table 2.

Wood is easier to gasify than coal because (1) it has a much higher volatile content (typically 70% to 90%) and (2) it contains its own water—two elements important in forming gaseous molecules from high-carbon feedstocks.

With a few exceptions, biomass has less than 2% ash (while coal is typically 5% to 20%), and the typical biomass sulfur content is less than 0.1% (compared with 1% to 4% in coal). Biomass materials have carbon contents considerably lower than coals, and the hydrogen/carbon ratio is typically 1.5; for coal it is close to 0.80.

These advantages of wood for gasification are offset in part by a high moisture content, low bulk density, and irregular size distribution. These properties require a gasifier with a high degree of fuel flexibility or up-front preparation such as drying, sizing, or biomass densification.

The lower bulk density, irregular size distribution, and lower heating value (Btu/lb basis) substantially reduce the throughput of wood gasifiers compared with coal gasifiers. Coal gasification facilities are more suited for large applications requiring more than 10 billion Btu/day of energy input.

Wood gasification, however, can be very attractive for smaller applications, such as retrofitting a 75,000 to 100,000-lb/hour steam package boiler or a 200-tpd rotary lime kiln.

Fluidized bed system design

A fluidized bed system to supply 110-million Btu/hour of low-Btu gas to a 200-tpd rotary lime kiln is detailed below to demonstrate the applicability of wood gasification technology to the pulp and paper industry. The fluidized bed design for illustrative purposes is generic in nature and is based on a composite of information received from several gasifier manufacturers and in-house Gilbert/Commonwealth information. A hog fuel with a 20% moisture content is the assumed feedstock for the design.

Combustion of low-Btu gas in a rotary lime kiln will require the replacement of the existing burner with a new low-Btu gas burner and its auxiliary equipment. Furthermore, the rotary kiln discharge hood must be pulled back and modified to accept the new burner. A schematic diagram of the kiln is shown in Figure 2.

The new burner should be designed to co-fire both low-Btu wood gas and fuel oil (or natural gas). The fuel oil serves three functions:

1. A majority of the time it serves as a continuous pilot with a minimum of fuel flow for the wood gas
2. It serves as a backup fuel when the wood gasifier is not operating
3. It is used for control to adjust the kiln temperature, if necessary.

Rotary kiln performance utilizing low-Btu gas is dependent on fuel combustion characteristics such as fluegas volume, adiabatic flame temperature, and combustion air requirements. Table 3 lists the combustion characteristics for the stoichiometric firing of low-Btu gas, natural gas, and fuel oil.

In general, the combustion of low-Btu gas will not result in the same heat absorption, thermal efficiency, flame length, or flame temperature as fuel oil or natural gas. As a result, a kiln capacity derating of 10% to 20% may result when low-Btu gas replaces natural gas or fuel oil. The kiln capacity can be maintained by firing an incremental amount of low-Btu gas above the conventional fuel heat duty. Other possible options to reduce derating involve the use of drier feedstock, preheating combustion air and/or gasification air, and co-firing low-Btu gas with 10% fuel oil or natural gas.

A reduction of the kiln's primary and secondary excess air requirement for low-Btu gas compared with natural gas or fuel oil can also reduce the incremental amount of low-Btu gas required to prevent derating.

TABLE 4: **Conceptual cost estimate for a 110-million Btu/hr fluidized bed gasification system to fire a rotary lime kiln**

Gasifier heat duty (million Btu/hr)	110
No. of gasifiers	1
Type	Fluidized bed
Capital cost, $ million (Second quarter 1982)	
Total direct installed cost	3.200
Total indirect cost	0.428
Total plant investment	3.628
Land cost	—
Working capital	0.131
Startup	0.350
Total project capital cost	**4.109**
Operating cost, $ million/yr (7,000 hr/yr)	
Wood feed cost (at $20/bone-dry ton)	0.924
Electric cost (at $0.04/kWh)	0.130
Direct labor	0.475
Net operating cost	**1.529**
Product gas cost, $/million Btu	**1.529**
First-year gas costs	3.20

TABLE 5: **Assumptions used in economic analysis**

Plant life (yrs)	20
Construction period (yrs)	2
Debt period during construction (months)	8
Interest rate (%)[1]	10.5
Working capital	30 days wood plus 1% TPI
Discounted cash flow rate of return (%)	15
Federal tax rate (%)	48
Local taxes and insurance (%)	2
Depreciation	14 year sum-of-digits

[1] The fixed capital charge rate based on the above financial parameters is 22.69%/yr

$$\text{First year gas cost, \$ million Btu} = \frac{N + 0.2269\,(TPC)}{G}$$

N = operating cost, TPC = total project capital cost
G = product gas rate in trillion Btu/yr

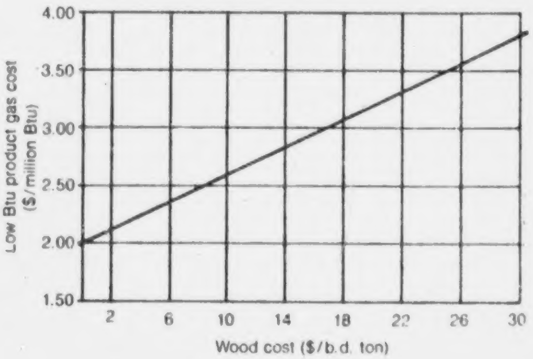


FIGURE 3: **Low Btu product gas cost vs wood feed cost for a 110-million Btu/hr fluidized bed gasification facility**

Reduction of the combustion air requirement for low-Btu gas will also reduce the fluegas volumetric flow rate exiting the kiln. The fluegas volumetric flow for low-Btu gas will still be somewhat higher than conventional fuels, but not enough to significantly increase kiln dusting.

In summary, the steps required to retrofit the kiln from conventional fuel to low-Btu gas include:

- Replacement of the existing burner with a dual low-Btu gas/conventional fuel burner
- Reduction of the primary air supply to provide a multilouver outlet damper on the primary fan discharge
- Reduction of the kiln secondary air supply by the addition of seal devices around the firing hood
- Installation of a water spray, if necessary, on the suction side of the kiln induced draft fan to prevent exiting fluegas from exceeding the design temperature of the fan.

Conceptual cost estimate

A conceptual cost estimate for a fluidized bed gasification system to produce 110-million Btu/hour of low-Btu gas for a 200-tpd rotary lime kiln is shown in Table 4. Included in the direct installed cost are the wood storage unit, wood preparation unit, gasification unit, ash storage unit, kiln burner retrofit equipment, and utility support systems.

The direct installed cost includes all architectural, structural, civil, piping, equipment, instruments and controls, electrical, and site preparation costs.

The total capital cost for the facility is $4.109 million, and the annual operating cost is $1.529 million based on a 7,000-hour/year operating level. All costs are second-quarter 1982 U.S. prices.

The first year average gas cost is $3.20/million Btu based on a fixed capital charge rate of 22.69%/year. The financial parameters used to calculate the first-year average product gas cost are shown in Table 5. The financial parameters used in this table assume a stable economy with accompanying moderate interest rates.

A plot of first-year product gas cost vs wood feedstock cost is shown in Figure 3, based on the same total capital cost estimate and financial parameters mentioned previously. As illustrated by this figure, the economic competitiveness of low-Btu gas is sensitive to the availability of low-cost wood feedstock.

Conclusions

Wood gasification technology in the pulp and paper industry has numerous applications. Low-Btu gas may be used to replace natural gas and fuel oil in lime kilns, boilers, and dryers in a typical pulp and paper mill.

In the 1980s, with the advent of natural gas deregulation as well as the possibility of escalating fuel oil prices, wood gasification should provide an economical alternative to conventional energy uses for the pulp and paper industry. ☐

Sodium hydrosulfite markets poised for recovery

By BARRY SHOCKETT

The U.S. domestic market for merchant sodium hydrosulfite has been on a downward trend for two years but is expected to recover somewhat in 1983. Demand in 1982 was an estimated 44,000 tons, compared with 55,000 tons for both 1980 and 1981. However, exports rose again last year to 18,000 tons, returning to the 1980 level. Exports had dropped in 1981 to 15,600 tons.

There is still no domestic source in Canada for sodium hydrosulfite, and both merchant hydrosulfite and the Borol precursor for onsite production are imported. Last year pulp and paper industry demand dropped about 6% due to the drop in pulp and paper production, but an increase to around 18,000 tons is expected in 1983.

U.S. statistics, sodium hydrosulfite* (000 short tons)

	1980	1981	1982e	1983e
Nameplate capacity	75	73.5	61	67
Production	73	71	60	66
Imports	0.1	0.3	1.9	2
Exports	18.1	15.6	17.7	18
Apparent consumption	55	55.7	44.2	50
Pulp and paper	16.5	16.7	16.7	18

*Not including onsite production via Borol
Sources: Bureau of Census, Dept. of Commerce; Pulp & Paper and industry estimates

Canadian statistics, sodium hydrosulfite* (000 short tons)

	1980	1981	1982e	1983e
Imports†	10.5	11.6	11	11
Total demand	10.8	11.5	10.8	11
Pulp and paper	9.5	10.3	9.7	9.9

*Not including onsite production via Borol
†No sodium hydrosulfite is produced commercially in Canada

SODIUM HYDROSULFITE

UNITED STATES

Uses: Sodium hydrosulfite is used as a bleaching agent for mechanical and deinked pulps. The textile industry is the largest consumer, and clay refining and specialty chemicals consume some.

Demand: Although total domestic demand for sodium hydrosulfite dropped substantially last year (almost 20%), pulp and paper usage remained relatively steady at about 16,700 tons. This is due to an increased customer base, although individual mill use was generally down because of lower production of most pulp and paper grades. An estimated 8,700 tons (100% basis) were produced onsite via the Borol process. The reduction in total demand boosted pulp and paper's share of the market to almost 38%. Exports last year were over the 17,500-ton mark—a reversal from 1981.

Sources: There are now two sodium hydrosulfite producers in the U.S.—Virginia Chemicals Inc. and Olin Corp. Virginia Chemicals acquired the number-three producer in late 1981, but then closed the facility and now has three facilities. Morton-Thiokol's Ventron division is the sole supplier of Borol solution.

Availability: Although nameplate capacity has decreased because of the Royce closure, operating rates have remained over the 95% level. No shortages are foreseen in the near future.

Pricing: Competitive pressures and the recessionary climate prevented a price increase from occurring in 1982. The 60¢/lb price originally posted on Dec. 1, 1981 is still in effect. If the economy recovers as predicted, there may be a 5% hike after midyear. Pricing history: 1982, 60¢/lb, proprietary blends, f.o.b. producing point; 1981, 55¢-60¢/lb; 1980, 43.5¢-55¢/lb.

Forecast: As the economy recovers, pulp and paper usage should increase in 1983 between 7% and 8%. Total merchant demand is expected to reach the 50,000-ton level.

CANADA

Uses: Sodium hydrosulfite is used mainly by newsprint and groundwood-specialties mills to bleach mechanical pulps. The other minor end-use is vat dyeing of cotton.

Demand: In 1982, an estimated 9,700 tons of merchant sodium hydrosulfite were used by the pulp and paper industry, out of a total demand of 11,000 tons. A modest increase to just under 10,000 tons is expected for 1983. On a 100% basis, about 17,500 tons of hydro were produced in 1982 via the Borol process.

Sources: The major supplier to the mills is VirChem Canada Inc., which imports from its U.S. parent. Several distributors bring in product from offshore sources.

Availability: The Canadian market is relatively small, and thus no shortages are likely in the foreseeable future. 1982, market; 1981, market; 1980, market.

Pricing: Exchange adjustments over the past few months have brought the price of blended sodium hydrosulfite to 71¢/lb, while unblended product went up Apr. 1, 1983 4.5¢/lb to around 65.5¢/lb. Pricing history: Blended sodium hydrosulfite: 1982, 69¢-71¢/lb; 1981, 59¢-64¢/lb; 1980, 51.4¢/lb; 1979, 50.5¢/lb. Nonblended: 1982, 61¢/71.5¢/lb; 1981, 66.4¢-71.5¢/lb; 1980, 56¢-66¢/lb.

Forecast: The demand for both merchant hydrosulfite and Borol product are expected to increase modestly in 1983. Borol usage should rise about 440 tons (12% basis), while demand for the merchant grade should increase about 220 tons.

Mr. Shockett is consulting editor-chemical markets for Pulp & Paper.

PULP & PAPER

June 1983

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Mechanical Pulping

SPECIAL REPORT: **CLEANING/SCREENING**

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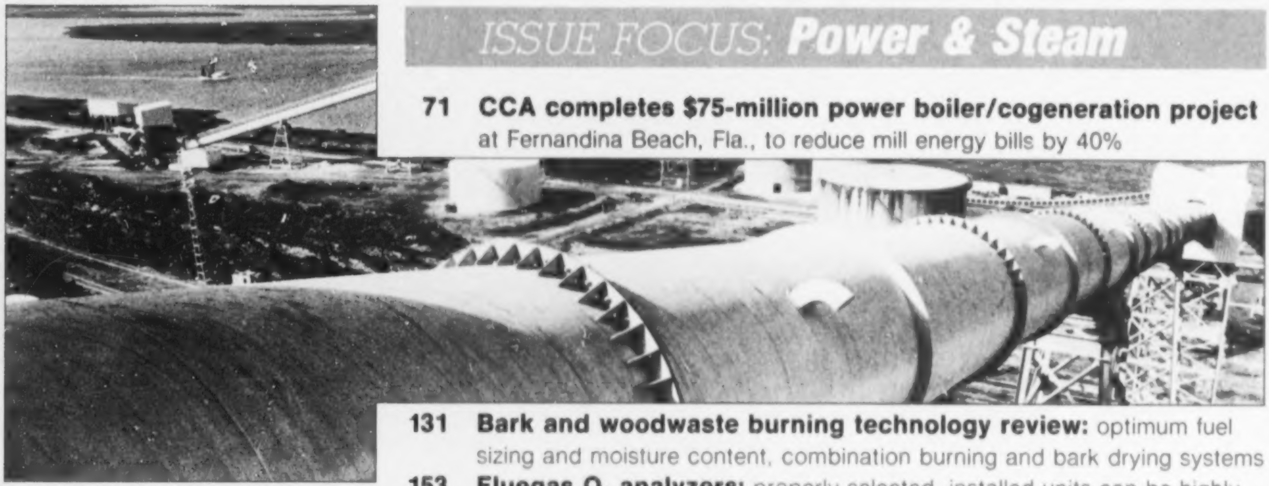

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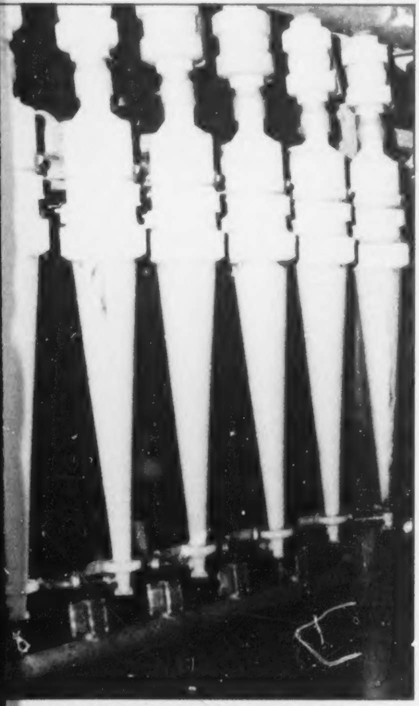

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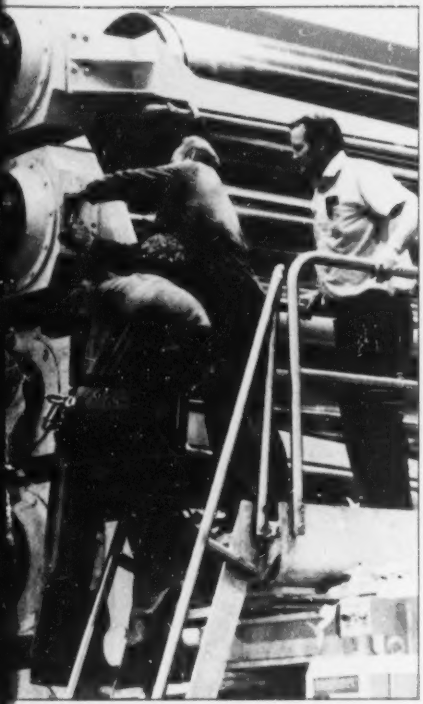

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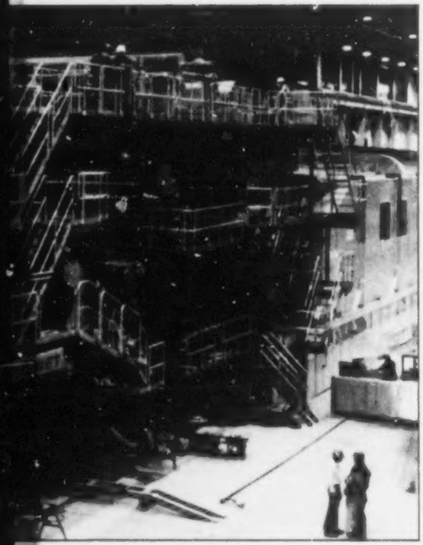

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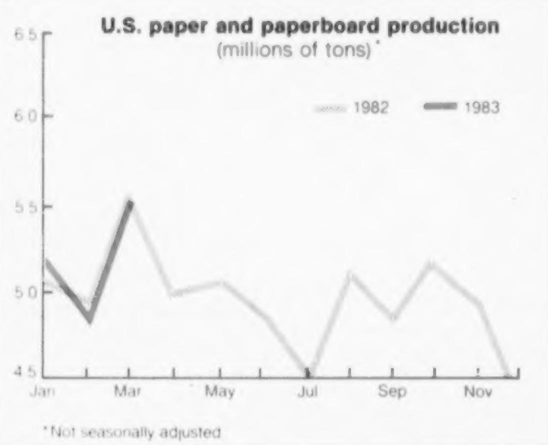
MONTH IN STATISTICS

U.S. paper and paperboard production totaled 5.5 million short tons in March, down 1.1% from year-earlier levels, according to the American Paper Institute. The first-quarter production trend, adjusted for seasonal and workday factors, was 62.3 million tpy, up 2.1% from last year and even with the record-year 1981.

Among major grades, production of uncoated free-sheet paper was up 6.6% from last year, while coated paper gained 7.4%. Tissue production showed an increase of 2.1% over the first quarter of 1982. Packaging grades remained weak, with kraft paper production down 4.3% from year-ago levels. Among paperboard grades, kraft linerboard gained 3.6% over March, 1982, and recycled paperboard was up 2.6%. Production of kraft linerboard for export remained strong, showing an 11.6% jump over first-quarter 1982 levels.

Total Canadian newsprint shipments totaled 676,000 metric tons in March, down 10.6% from a year ago, said the Canadian Pulp & Paper Assn. Newsprint mill operating rates were 80%, compared with 91% last March. Woodpulp shipments totaled 352,000 metric tons, down 8.9% from year-ago.


U.S. paper and paperboard production
(millions of tons)*

*Not seasonally adjusted

		Latest month (000 short tons)	% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION[1]					
Newsprint	March	448	−3.9	5,235	−2.1
Uncoated groundwood (s)	March	124	2.4	1,388	0.3
Coated paper (s)	March	453	4.9	5,283	7.4
Uncoated free sheet (s)	March	766	14.2	8,519	6.6
Unbleached kraft packaging and industrial (s)	March	313	−8.7	3,804	−4.3
Tissue	March	395	2.6	4,626	2.1
Total paper	**March**	**2,774**	**2.2**	**31,914**	**2.2**
Kraft linerboard, unbleached	March	1,306	2.7	14,465	3.6
Semichemical medium	March	395	—	4,491	0.2
Bleached paperboard	March	335	0.6	3,843	1.3
Recycled paperboard	March	617	0.3	7,023	2.6
Total paperboard	**March**	**2,745**	**1.1**	**30,814**	**2.0**
Total paper and paperboard*	**March**	**5,519**	**−1.1**	**62,728**	**2.1**
PULP, WASTEPAPER & FIBER[2]					
Total woodpulp production	February	4,045	−3.4	49,752	0.8
Market pulp production	February	488	−8.4	5,597	−2.3
Wastepaper consumption at paper/board mills	February	1,106	−5.4	13,698	4.8
Pulpwood consumption (cords)	March	6,771	4.0	82,596	6.7
CONVERTED PRODUCTS STATISTICS[3]					
Corrugated box shipments (billion ft²)	March	29.891	3.5	60.586†	2.9
Containerboard inventories at box plants	Mar. 1	2,462	−2.4		
INTERNATIONAL TRADE[2]					
U.S. paper imports (including products)	February	554	−9.3	7,427	−3.5
Imports of Canadian newsprint	February	432	−20.0	5,837†	−12.0
U.S. paper exports (including products)	February	374	16.1	4,341	14.6
Exports of unbleached kraft linerboard	March	195	8.3	2,123	11.6
Exports of woodpulp	February	263	−13.2	2,983	−5.1
CANADIAN STATISTICS[4] (reported in metric tons)					
Total newsprint shipments	March	676	−8.8	1,885†	−10.6
Operating rates	March	80%	91%	81%	94%
Inventories held by U.S. consumers	Mar. 31	1,260	−24.6		
Woodpulp shipments (export only)	March	352	−9.7	970†	−8.9
Operating rates	March	83%	91%	82%	88%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fiber Box Assn., Paperboard Packaging Council. 4. Canadian Pulp & Paper Assn.
*Includes construction and wet machine grades. †Not annualized. ‡Not directly comparable to year ago because of coding change. (s) = shipments.

FINANCE

First-quarter profits drop—but upturn seen

Despite some faint signs of improving market conditions, U.S. pulp and paper industry profits dropped 26.1% in the first quarter of 1983 from a year earlier. And even though lower interest rates are causing a rebound in housing starts, forest product companies only reported a 7.7% increase in their still highly depressed earnings, financial reports from seven major companies show. International Paper Co. reported first-quarter earnings of $69.5 million compared with $60 million a year ago. However, first-quarter 1983 results included a pre-tax gain of $60 million from the sale of timber, while year-ago results included $17.2 million from the sale of tax benefits. Excluding these items, operating earnings only amounted to $9.5 million, a 78% drop from a year earlier.

Intense competition. St. Regis Corp. reported a 52% drop in profits to $11.2 million, which partly included sale of tax benefits. "Business conditions continue to be depressed for many of our products due to a climate of intense competition and reduced demand in the marketplace," commented William R. Haselton, chairman and CEO. Crown Zellerbach Corp. reported a profit of $20.4 million, after a similar size loss from operations in the final quarter of 1983.

The largest company still in the loss column was Mead Corp., which posted a first-quarter deficit of $11.9 million compared with a year-ago profit of $13.8 million. Among producers of unbleached paperboard and packaging, Union Camp Corp. reported a 17% decline in earnings to $26.8 million.

Tissue producers continued to show the best earnings results, helped by the less cyclical nature of their markets, cost-reduction programs, and lower fiber costs. Fort Howard Paper Co., for example, posted a 7.8% earnings gain despite highly competitive markets and continuing pressure on selling prices. Scott Paper Co.'s profits were up 2.6% to $19.1 million, while Kimberly-Clark's declined 9.0% to $52.5 million.

Wood products strengthen. A number of forest products companies registered dramatic increases as prices and demand surged, although profit margins remained highly depressed. Potlatch Corp., for example, posted a 116.7% increase in profits to $9.7 million on a 6.9% rise in sales to $215.2 million. Weyerhaeuser Co., however, showed a 60.6% decline in earnings to $22.5 million on a 3.0% rise in sales to $1.09 billion. Georgia-Pacific earnings were up 20.0% to $30.0 million, on sales of $1.4 billion, up 18.3%. Louisiana-Pacific Corp. reported earnings of $4.3 million compared with a loss in the corresponding 1982 quarter, while sales jumped 22.2% to $240.3 million.

Canadian mills in red. Canadian pulp and paper companies continued to be hurt by the worldwide recession in the first quarter, with most firms reporting losses or significant declines in earnings from year-earlier levels. Sustained pricing weakness in market pulp and newsprint continued to depress Canadian financial statements, according to reports from ten producers. Lumber markets began to firm as the quarter progressed, however, helping to offset declines in pulp and paper sectors.

The ten firms reported a combined operating loss of C$31.2 million for the quarter compared with profits of $26.9 million in first-quarter 1982, on sales of $2.3 billion, down 5.1% from year-earlier levels.

U.S. PAPER/FOREST PRODUCTS RESULTS

	First quarter ($000)			
Paper companies	**Sales**	**Change 1983/82**	**Earnings[1]**	**Change 1983/82**
Chesapeake	$59,900	0.3%	$1,000	−47.4%
Consolidated	137,295	1.1	10,597	−2.8
Crown Zellerbach	617,100	−14.9[2]	20,400	264.0[2]
Federal Paper	125,721	2.2	149	−97.2
Fort Howard	133,355	10.8	23,500	7.8
Glatfelter	61,217	−10.9	4,417	−23.5
GN Nekoosa	371,700	1.0	15,200	−30.9
Hammermill	356,143	9.3	3,313	−53.3
Intl. Paper	1,088,100	8.5	9,500[3]	−77.8[3]
James River (1/23)[4]	421,855[5]	129.0	11,064[5]	152.0
Kimberly-Clark	811,000	10.4	52,500	−9.0
Longview (1/31)[4]	80,737	−13.1	(2,772)	n.m.
Mead	656,087	−4.9	(11,970)	n.m.
Mosinee	24,013	9.0	1,216	19.0
Pentair	69,872	3.0	1,715	−22.9
St. Regis	649,822	−3.9	11,226	−52.0[7]
Scott	567,463	−2.2	19,118	2.6
Sonoco	156,377	27.2	7,073	6.1
Sorg	20,506	2.6	729	n.m.[8]
SW Forest	142,000	−2.0	(6,855)	n.m.
Stone Container	119,374	13.2	(962)	n.m.
Union Camp	421,010	13.0	26,084	−16.9
Wausau (2/28)[4]	42,193	−5.9	1,202	n.m.[8]
Westvaco	343,764	0.3	7,802	−6.3
Willamette	247,225	15.4	3,737	n.m.[8]
Total	**7,723,809**	**5.3**	**209,703**	**−26.1**
Forest products				
Boise Cascade	770,980	8.0	11,130	100.2
Champion Intl.	1,001,175	10.5	8,256	1,238.0
Georgia-Pacific	1,419,000	18.3	30,000	20.0[6]
Louisiana-Pacific	240,300	22.2	4,300	n.m.[8]
Pope & Talbot	66,853	12.1	2,187	155.2
Potlatch	215,152	6.9	9,717	116.7
Weyerhaeuser	1,089,483	3.0	22,460	−60.6[6]
Total	**4,802,943**	**10.8**	**88,050**	**7.7**
U.S. total	**12,526,752**	**7.3**	**297,753**	**−17.9**

CANADIAN PAPER INDUSTRY RESULTS

Abitibi	C$387,305	−6.6%[7]	C$781	−97.3%[7]
B.C. Forest	195,000	−1.5[7]	(16,900)	n.m.[7]
B.C. Resources	178,300	24.5	132	n.m.[8]
Con-Bathurst	342,000	−5.7	9,100	−48.3
Domtar	410,000	−6.3	500	−95.8[7]
Fraser	96,999	−5.6	1,681	17.6
Great Lakes	104,958	−20.7[7]	(7,721)	n.m.[2]
Mac. Bloedel	442,000	−12.4	(23,000)	n.m.
Rolland	52,300	23.3	1,683	n.m.
Scott	59,517	12.5	2,542	14.3
Total	**2,268,379**	**−5.1**	**(31,202)**	**n.m.**

1. Income after taxes, from continuing operations, excluding most significant nonrecurring items in both years (if reported on after-tax basis).
2. First-quarter 1982 includes CZ Canada interest sold effective year-end.
3. Excludes net gains of $60 million from sale of timber in 1983 quarter and $17.2 million from sale of tax benefits a year ago.
4. Period ended. Figures for James River are 3rd quarter, Wausau 2nd.
5. Latest quarter includes Dixie Northern operations acquired in July 1982.
6. Excludes effect of accounting change in 1982 first quarter.
7. 1982 figures restated by company.
8. Not meaningful due to loss in 1982 first quarter.

n.m. = not meaningful. ( ) = loss.

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Corrugating medium: Rising output, flat capacity should help operating rates

Statistics	**1981**	**1982**	**1983e**
Production, 000 tons			
Semichemical[1]	4,719	4,381	4,505
Recycled[1]	1,141	1,158	1,240
Total	5,860	5,539	5,745
Capacity, 000 tons			
Semichemical	4,988	5,273	5,249
Recycled	1,349	1,423	1,469
Utilization rates, %			
Semichemical	94.6%	83.1%	85.8%
Recycled	84.6	81.4	84.4
Imports, 000 tons[2]	52	47	50
Exports, 000 tons[2]	66	61	80
Apparent U.S. consumption			
000 tons	5,846	5,525	5,715
lb/capita	50.9	47.6	48.8
000 tons/$billion real GNP (1972)	3.89	3.74	3.77

[1] American Paper Institute [2] Bureau of Census

Grade structure: Corrugating medium includes paperboard made from both semichemical pulp and recycled fiber. In 1981, 78% was made from semichemical pulp furnish (which normally contains at least 20% recycled fiber), and 22% was "bogus" medium, made from recycled fiber. Basis weights of corrugating medium are 22, 26, 33, and 36 lb/1,000 ft². Standard sheet weight is 26 lb, which accounts for more than 80%. Bogus for equivalent uses is normally produced in slightly higher weights.

Production/capacity: In 1982, production of corrugating medium declined by 5.5% to 5.5 million tons, reflecting a 4.6% drop in corrugated box shipments caused by the deep slump in industrial production. Semichemical medium output dropped 7.2%, while recycled medium appeared to regain some market share by rising 1.5%. The increased competitiveness of recycled medium probably reflects reduced wastepaper and fuel oil costs.

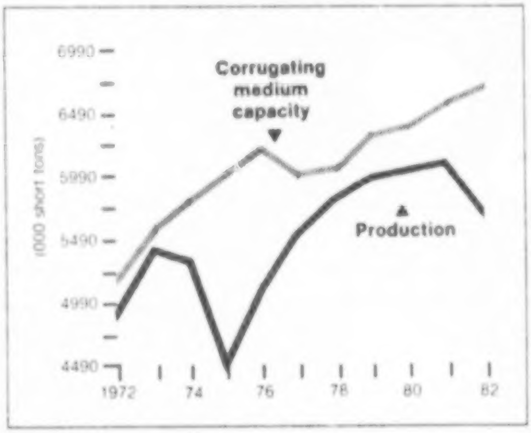
Operating rates for semichemical medium mills declined sharply from 94.6% in 1981 to 83.1% in 1982, while rates of recycled medium mills only showed a slight decline in 1982, to 81.4%, after experiencing the brunt of the recession of the previous year. Hurting operating rates in 1982 was a 5.6% jump in medium capacity, with both semichemical and recycled showing about the same size increase.

New capacity included International Paper Co.'s 270,000-tpy semichemical medium machine started up at Mansfield, La., in late 1981, and MacMillan Bloedei's new 210,000-tpy semichemical machine, which came on at Pine Hill, Ala., in late 1982.

Outlook: In 1983, corrugating medium production is projected to rise about 3.7% to 5.7 million tons, reflecting about a 4.0% rise in corrugated container shipments and modest inventory reduction (35,000 tons).

Semichemical medium output was essentially flat for the first quarter and is projected to show a 2.8% rise for all of 1983. Recycled was up 11.6% for the first quarter and is projected to show a gain of 7.1% for the full year. However, it will lose some of its competitive edge as wastepaper costs begin to rise.

Operating rates are projected to rise to 85.8% for semichemical and to 84.4% for recycled medium in 1983, but actual rates will probably be somewhat higher once capacity figures are adjusted for a number of mill and machine shutdowns.



Estimated capacities of major U.S. companies are:

	Annual capacity (000 tons)			
	Semi-chemical medium	**Recycled medium**	**Total**	**Capacity share %**
1. Owens-Illinois	580	—	580	8.6
2. Weyerhaeuser	575	—	575	8.6
3. Container Corp.	235	155	390	5.8
4. Inland Container.	175	210	385	5.7
5. Willamette Industries	230	120	332	4.9
6. Champion Intl.	200	102	320	4.8
7. Packaging Corp. of America	254	—	254	3.8
8. Stone Container	247	—	247	3.7
9. International Paper	243	—	243	3.6
10. MacMillan Bloedel	210	—	210	3.1
11. Virginia Fibre	208	—	208	3.1
12. Alton Packaging	—	200	200	3.0
13. Great Southern	176	—	176	2.6
14. Crown Zellerbach	91	84	175	2.6
15. Weston Paper	135	—	135	2.0

U.S. capacity (1983): **6.718 million tons**
Capacity share of top five companies: 33.7%
Capacity share of top ten companies: 52.6%

Prices: Corrugating medium producers implemented a $20/ton price increase in March and April, which brought the list price of 26-lb semichemical medium back to $260/ton. Prices will probably not fully return or exceed their former prerecession list level of $290/ton until late this year or early 1984.

Pricing: Pricing history of 26-lb semichemical medium in the East is as follows: 1970, $110/short ton; 1971, $120; 1972, $120; 1973, $135; 1974, $185; 1975, $190; 1976, $195; 1977, $185/$195; 1978, $210; 1979, $260; 1980, $260; 1981, $290; 1982, $260.

Industry's safety record improved as a result of intensified efforts

Despite increases in both worker hours and accident cases reported, accident rates in U.S. pulp and paper mills declined during the past year

By GLORIA STASHOWER

☐ Declines in lost workdays and incidence rates caused by accidents in U.S. pulp and paper mills reflect a growing concern about safety in the industry. Last year, the total number of workdays lost dropped to 3,893 from 4,174 in 1981, and incidence rates were down to 7.7 from 8.6, according to the American Paper Institute. Incidence rates reflect the number of incidents to the number of workdays.

These improvements occurred despite the rise in total cases, which went to 11,432 in 1982 from 11,072 the year before, and the rise in work hours, which went to 296.8 million from 257.6 million.

This increasing emphasis on safety, however, is not the result of stricter regulations or better enforcement from the Occupational Safety & Health Administration. Instead, more companies are recognizing that achieving excellence in safety means not only sending your workers home hale and hearty, but also increasing their efficiency and productivity as well as corporate profits.

"Our outstanding safety performance has been one of the few bright spots in a difficult year," said Continental Forest Industries president Jess Belser. With safety a top priority in all units, several CFI locations have set records for hours worked without lost-time accidents.

CFI has received numerous national and regional awards, including two of the six annual safety awards presented by API last year. Workers' compensation rates spiraled between 1978 and 1981, but CFI's insurance costs rose only 6% overall and actually decreased by 35% in the company's 16 corrugating plants.

Annual safety awards

This year's API safety awards given at the annual Paper Week convention in March went to Scott Paper Co.'s S.D. Warren div., Buckeye Cellulose Corp., Procter & Gamble Co., International Paper Co., and Boise Cascade Corp.

At Boise Cascade, an intensive safety program begun in the mid-1970s has yielded impressive results. Company accident incidence rates have gone down continuously between 1975 and 1982, said Jerry Fields, Boise manager of safety and workers' compensation.

Even with a larger work force, the company's total number of industrial injuries decreased about 58% in that period. An especially notable record was made in 1982, when accidents were down 29% from the previous

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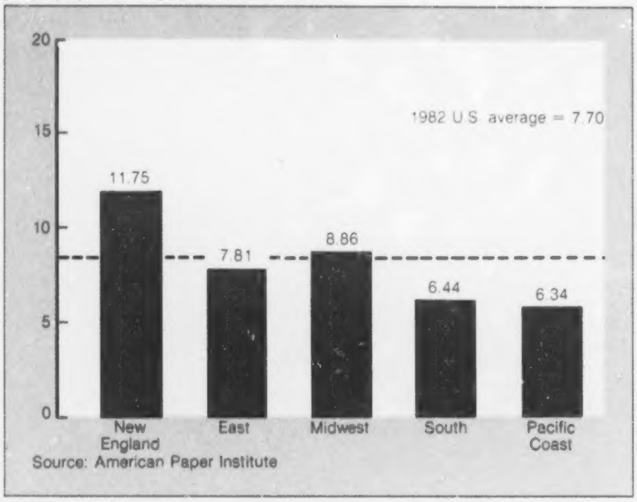
Mrs. Stashower is editor of internal communications at Continental Forest Industries.

TABLE 1: **1981-1982 comparison table**

	Number of reporting mills		Total working hours		Total cases		Lost workday cases		Incidence rates: Total cases		Incidence rates: Lost workday cases	
Region	**1982**	**1981**	**1982**	**1981**	**1982**	**1981**	**1982**	**1981**	**1982**	**1981**	**1982**	**1981**
New England	39	29	35,007,930.2	21,531,316.4	2,057	1,927	888	1,022	11.75	17.90	5.07	9.49
Eastern	38	42	37,649,541.25	32,290,616.8	1,470	1,684	545	617	7.81	10.43	2.30	3.82
Midwest	73	60	57,942,312.87	50,896,945.1	2,567	2,275	924	953	8.86	8.94	3.19	3.74
Southern	90	76	143,016,009.45	125,980,671.3	4,605	4,190	1,183	1,026	6.44	6.65	1.65	1.63
Pacific Coast	31	32	23,139,452	26,920,529.5	753	996	353	556	6.34	7.40	3.05	4.13
U.S. total	271	239	296,755,245.77	257,620,025.1	11,432	11,072	3,893	4,174	7.70	8.60	2.62	3.24

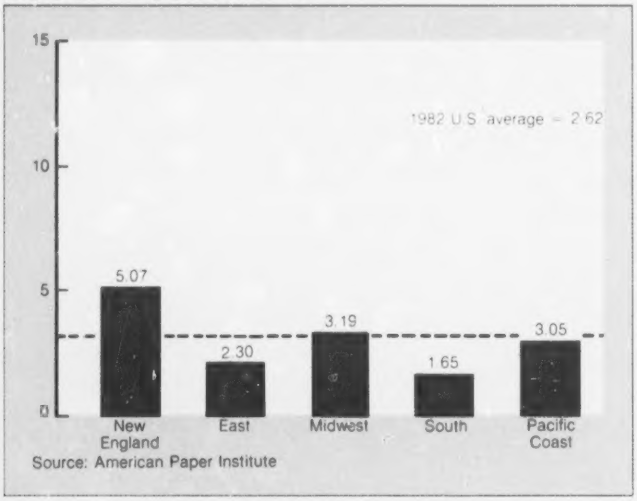
Source: American Paper Institute

FIGURE 1: **1982 total cases incidence rates, pulp, paper, and paperboard mills**



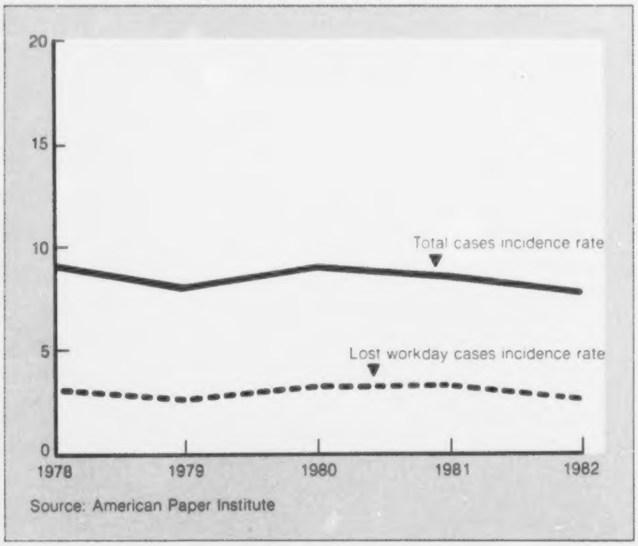
Source: American Paper Institute

FIGURE 2: **1982 lost workday cases incidence rates—pulp, paper and paperboard mills**



Source: American Paper Institute

FIGURE 3: **U.S. total—pulp, paper and paperboard mills**



Source: American Paper Institute

year; lost workdays declined 14%, and total workers' compensation costs dropped 3%.

Although results for any one year may be misleading, Fields can point to measurable and steady progress, which he attributes to "a visible, professional accident prevention program with structured management accountability." Accountability leads the list of common elements found in successful safety programs.

"Every level needs to know what's expected of it," said Bruce Higdon, manager of loss prevention for Champion International Corp.'s southern region. Champion begins at the top, with the chief executive officer receiving reports on the year's goals and objectives in loss prevention.

"Division heads are accountable for meeting those goals, and it is a significant part of their evaluation. It then goes down the line, with each operating manager, department manager and supervisor doing the same," he said.

Crown Zellerbach has a similar policy. "The safety performance of the managers of our various business units can weigh as much as 20% or 25% in determining their bonuses and merit increases," said Roger Larsen, CZ's corporate manager of health and safety. The company's accident incidence rates have gone down 35% in the past five years.

Boise Cascade and International Paper also base their review of managers' performance at least partially on their record in accident prevention.

Mills held accountable

Besides relating safety to a manager's compensation rewards, many companies now hold locations accountable. Dollars are added or subtracted from a facility's profit and loss statement based on its accident record for the previous year.

For the past four years, CFI has used a retrospective system. Each corrugated and fiber drum plant is budgeted a certain amount for workers' compensation. At the end of the year, adjustments are made according to the plant's success or failure in relation to its budgeted costs.

"Now our plants have not only human but dollar reasons to improve," said Dick Rogers, industrial relations manager of CFI's corrugated unit.

St. Regis has had similar results since retrospective ratings for all locations were introduced two years ago. Alan Kaplan, director of corporate safety and environmental health, noted that one plant was charged "an additional $40,000/month off the top" because of its poor performance over the past three years.

Such direct costs can carry a potent message, but safety professionals agree that covering workers' compensation claims is only the beginning of accident-related costs.

Numerous hidden expenditures include morale, labor relations and community image. In addition, a safe facility is usually cleaner, more efficient and more productive, executives said.

At CFI's Hopewell, Va., linerboard mill—now working on 2.5 million work hours without a lost-time accident—changes have been made in the way plant inspections are routinely done.

Julius Sheppard, mill supervisor of safety, health and training, personally conducts triannual inspections, some of which are unannounced. He is always accompanied by a supervisor and an hourly worker. Outstanding departments receive the Mill Manager's White Glove Award and their achievements are well publicized. Examples of poor housekeeping, on the other hand, are circulated in a report and are corrected.

Safety boosts productivity

Another benefit of a safety program that works is improved productivity through better use of people.

"We unite on a common goal—a safer mill—and we have to work in unison. It can't be we-they," said Rick Watson, Scott Paper Co.'s corporate manager of safety and security.

Scott has introduced small group sessions aimed at teaching people how to observe their own actions. "An individual becomes a team player aligned with the business purpose when he or she is involved as a person and not treated as just another variable in the production equation," said Watson.

"The only approach that works is to make people part of the problem-solving process," said Larsen. He sees CZ's declining accident rate as the direct result of involving employees in the development of a safety program at each location.

"You eliminate the adversary relationship and agree on acceptable standards of performance which the supervisor can then hold people to," he explained.

Both Watson and Larsen caution, however, that a worker-involvement program takes time to develop and may require professional help to implement. "It's best done in bite-size pieces," said Watson. "If a mill has been operating a certain way for years, there can be a fear of change," he noted.

One innovative approach to promoting safety through changing people's behavior was introduced in 1982 at St. Regis. An 11-session accident prevention training course designed for first-line supervisors was developed inhouse by safety and human resources personnel.

"Industry has done little to train supervisors in how to deal with people," said Kaplan. "Our emphasis used to be on how to recognize an unsafe condition, but over 90% of accidents are due to the unsafe acts of people."

Using video modules, role playing and key phrases, the course suggests ways of correcting an employee who isn't working safely, without creating resentment or antagonism.

Motivation is the key

Although commitment from corporate executives, mill managers and supervisors is vital in establishing a safety program, employees really determine its success, and their continued support should be promoted. "Management sets the tone, but the people make the record," said Albert Oetken, CFI vice president of brown mill operations.

"When one of our mills reaches a safety milestone, such as 2 million work hours at Hopewell, this is the only kind of record to which every single employee contributes, from a 50-year veteran to a one-week newcomer," he said.

Hopewell mill manager Leroy Coker communicates constantly with his workers to reinforce the importance of safety.

"Certain things in life are worthwhile," he wrote in a recent newsletter. "Taking care of ourselves and our fellow employees in an accident-preventive environment is one of them."

Motivational programs used to remind and reward people range from free coffee and donuts for an accident-free month to an elaborate barbecue for completing a safe year. Their value, however, may depend somewhat on the respect accorded the person sending the message and the support provided in the workplace.

Champion's Higdon points out that "a beautiful program on paper" can be destroyed when safety is placed second to production. From a business standpoint, he notes, the two should never be in conflict because a good safety program, in the long run, augments rather than slows production.

Companies with dramatically improved records acknowledge that the effort has to be constant and continuous. "Safety isn't just an accident," said CFI's Oetken. "It doesn't just happen."

The ongoing effort must include thorough orientation of new employees and a complete job safety analysis that gives step-by-step descriptions of procedures, defines potential hazards, and lists protective equipment required.

Thorough analysis is also needed to identify high-risk areas and put in controls and countermeasures. Some companies are now using database systems to store loss prevention information.

Indications are that safety in the paper industry is beginning to be managed like any other part of the business. That means setting goals, planning, organizing and controlling safety with the same attention as that given to production or quality. □

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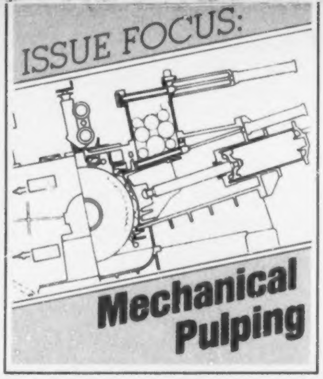

Pressure groundwood status report: ten mills now using the process

Mill experience has shown that pressure grinding has lived up to, or even surpassed, all expectations from original pilot studies conducted

By RISTO KAROJARVI and HANNU SALAKARI

☐ The development of pressurized grinding from the experimental stage into a commercial process has occurred very quickly. Tampella and MoDoCell started trials in 1977. The first pressure grinder was started up in May 1979 at the MoDoCell Bure mill in Sweden. Today, commercial pressure groundwood (PGW) plants have been operating from one- to two-and-a-half years, and PGW is used in all major paper and board grades that contain mechanical pulp.

Thirty-seven pressure grinders for ten mills around the world have been delivered or are on order today. The annual production capacity of these grinders exceeds 1 million tons (Table 1). Eight of the ten mill installations are in operation today. The latest of these, the huge Anjala PGW plant (capacity 1,480 a.d. tpd), was started up at the beginning of 1983. This article will discuss these installations and the operating results obtained from them.

Myllykoski: first commercial PGW plant

The Finnish paper company Myllykoski Oy is the world's largest producer of supercalendered (SC) paper. Its product, supercalendered uncoated, heavy-filled groundwood paper, is used mainly for rotogravure printing of magazines. The company has a reputation for high quality and is fully dedicated to SC papers.

Why did Myllykoski go to PGW? Due to a shortage of mechanical pulp capacity, a study of different alternatives was made. Thermomechanical pulp was not chosen because the company's research work indicated that TMP would have a negative influence on paper printability.

One of the first tasks for Tampella's PGW pilot plant in Anjala during the summer of 1979 was to produce 200 tons of pulp for paper machine trials at Myllykoski. These trials convinced Myllykoski that with PGW it could maintain SC paper printability and save chemical pulp to

TABLE 1: **PGW installations by grade**

Paper/board	Company/location	Country	Number of units	Wood species	a.d. tpd	Startup
Newsprint	Holtzmann & Cie AG, Maxau	W. Germany	6	Spruce, pine	350	1981
	Kajaani Oy, Kajaani	Finland	4	Spruce, pine	400	1982
	Leykam-Murztaler AG, Bruck	Austria	2	Spruce	160*	1982
	Tampella Ltd., Anjala	Finland	5	Spruce	615	1983
	Sappi Ltd., Ngodwana	S. Africa	2	Patula pine Taeda pine	145	1983
SC paper	Myllykoski Oy, Myllykoski	Finland	3	Spruce	165*	1980
	Madison Paper Industries, Madison, Maine	USA	4	Spruce, fir	310	1981
LWC paper	Oy Kaukas AB, Lappeenranta	Finland	2	Spruce	165	1981
Groundwood specialties	Tampella Ltd., Anjala	Finland	5	Spruce	615	1982
Folding boxboard	Tampella Ltd, Inkeroinen	Finland	2	Spruce	250	1983
	Oy Kymi-Kymmene AB, Juankoski	Finland	1	Spruce	65	1984
Market pulp	Modocell AB, Bure	Sweden	1	Spruce	55	1979
Totals			**37**		**3,295**	

*Includes units ordered, startup 1983

Mr. Karojarvi is technical manager, Tampella Ltd., Tampere, Finland, and Mr. Salakari is sales manager, TVW Paper Machines Inc., Boston, Mass.

such an extent that it was more economical to invest in pressure grinders than in conventional atmospheric grinders.

Myllykoski purchased two Tampella pressure grinders, which produce 110 tpd of pulp with a screened pulp freeness of 50 to 60 CSf. This first commercial PGW plant was started up at the end of June 1980.

Today, almost three years after the startup, the PGW pulp strength has considerably exceeded the level reached in trials. This strength improvement is based on operator experience and higher grinding temperature. Tear strength, especially, appears to depend strongly on grinding temperature (Figure 1). On No. 7 paper machine, where 30% to 40% of the mechanical pulp furnish is PGW, Myllykoski has been able to reduce the kraft content in the furnish by twice as much as the amount estimated in economic calculations used to justify the purchase of PGW.

Myllykoski owns, jointly with the New York Times Co., the Madison Paper Industries SC paper mill in Madison, Maine. This mill was expanded in 1981 to be the largest SC paper producer in North America. For this expansion PGW was chosen for the mechanical pulping process. Madison has very successfully brought more than 400 tpd of this new paper grade to the North American market, despite low paper demand. Madison has been operating without any curtailment since startup in the fall of 1981.

Myllykoski's confidence in PGW has been confirmed by the decision to expand its PGW plant at Myllykoski. Additional capacity will be obtained by adding a third pressure grinder to the system.

Operation experiences

All of the mills operating pressure grinders today also have regular grinders, a situation which provides an opportunity to compare pulp quality from these processes. The following discussions are based on operating data from these mills. All the quality comparisons have been made at equal pulp freeness.

A higher long-fiber content in PGW pulp has resulted in better tear strength in all mills. PGW's strength superiority over SGW has been from 40% (Holtzmann) to 58% (Kaukas).

The PGW process produces pulp with better bonding potential, resulting in improved tensile and burst strengths. The best results in this respect have been achieved at the Leykam-Murztaler mill in Austria, where the PGW breaking length is approximately 50% better than that of stone groundwood (SGW), and burst strength is about 70% better.

Better bonding properties have resulted in better surface strength and lower linting tendency in printing. For Leykam-Murztaler this consideration is most important because one of their main reasons for choosing PGW was to improve the offset printing capability of its paper.

Leykam-Murztaler has measured wet tensile strength of the pulps, and PGW has proved to be about 75% superior to SGW. This difference has clearly improved paper machine runability, although the share of PGW pulp in the furnish is only about 20%.

PGW pulp has a combination of pulp properties that matches the requirements of printing papers. Good strength is accompanied by excellent optical and surface properties. The opacity of PGW pulp has in all mills been equal to that of SGW.

On the other hand, PGW brightness with spruce is only one to three brightness points lower than SGW. For groundwood specialties and grades such as SC and LWC papers, PGW is very suitable, as confirmed by Myllykoski, Madison, and Kaukas.

Measurements at all PGW mills have shown that the specific power consumption in grinding to the same pit freeness level is equal (Table 2). In addition, most PGW mills are equipped with heat recovery systems recovering energy amounts of 40% to 50% of the power consumed in grinding.

The PGW process is well-suited to handle a wider raw material range than atmospheric grinding. The Holtzmann PGW mill normally grinds 40% to 50% pine. With atmospheric grinders, the mill is not able to use more than 10% to 15% pine because of quality reasons. Kajaani made a larger paper machine trial with pine PGW before the company chose pressure grinders because of an anticipated future shortage of spruce.

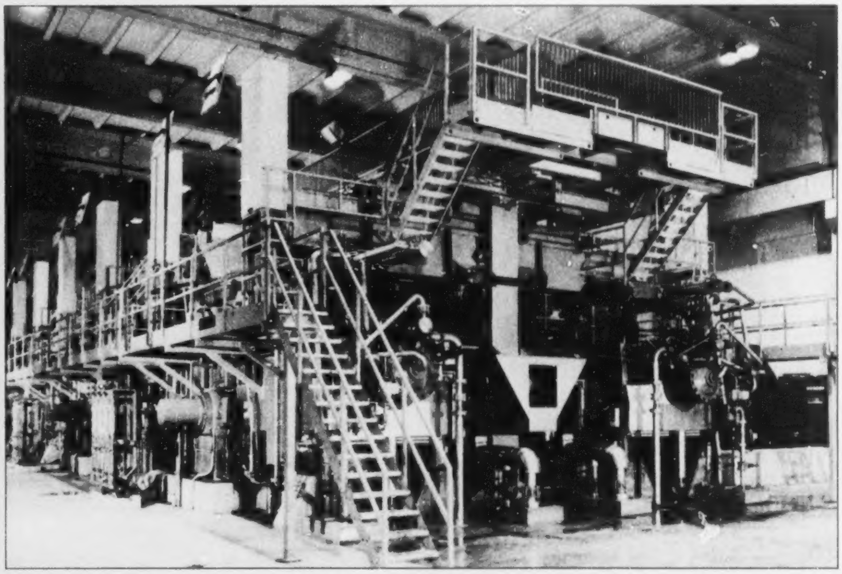

PHOTO A: The 320-tpd pressure groundwood installation at Holtzmann & Cie AG, West Germany.

PGW technology

PGW pulp mills are in some respects very different from conventional groundwood mills. The grinders are sealed and insulated, and open bull screens are not used at all. Very little steam escapes into the mill atmosphere. As a result, humidity is rather low, and room temperature is lower than normal in the grinder rooms.

Most mills have computerized instrumentation, which reduces labor requirements. In the new Anjala PGW plant, even log feeding to the grinders is remotely controlled from the operating room.

To supply the paper machine with pulp having an even better quality than the pit (raw) pulp, Tampella has conducted extensive screening studies at the Anjala pilot plant and at the Holtzmann PGW mill.

Based on these studies, a computer simulation has been developed that has been used with good results for designing the screening systems of the latest mills—such as Kajaani and Anjala—and also for optimizing process operation.

The design of the pressure grinder equipment has been very successful. With new machinery, few difficulties have occurred, and only small design changes have been needed. At Myllykoski, the uptime utilization of the pressure grinders was 86% during 1982. The downtime (14%) includes time lost due to reasons such as lack of power, lack of wood, lack of pulp demand, maintenance, and stone sharpenings.

The latest startups have been practically trouble-free, and the plants have reached their nominal production capacity within a few weeks of startup. For example, the Holtzmann PGW plant, which was designed for a nominal capacity of 350 a.d. tpd, is now normally producing 470 to 500 tpd.

The biggest operational problem, by far, has been the stone failures that occurred at several plants. Most of these failures have been of the same type, i.e., whole segments popping out from the stone core. Some of the failures have been caused by operational problems, such as heating the stone too quickly before startup or plugging the bottom stone showers due to high stock level in the grinder pit.

Research has shown that the main reason for these stone failures is that the fastening of the stone segments has not been satisfactory enough for operating at elevated temperatures. Stones with improved methods for segment fastening are now available, and with two of these stone types no such failures have occurred.

Today, a total of nineteen of these stones are operating successfully and the first ones have been in operation for 14 months.

Anjala mill

The most recent PGW startup was at Tampella's Anjala paper mill in Finland. The old Anjala groundwood mill, which was built in the 1930s, was making pulp for two paper machines producing groundwood specialities. This pulp mill was not an economical operation because of high labor requirements and maintenance costs.

The company decided to expand paper production capacity at Anjala by installing a new newsprint machine and by changing the nearby Inkeroinen board mill from wastepaper-based grades to production of folding boxboard using groundwood filler. Furnish for the expansions is PGW.

The new PGW plant, with a capacity of 1,480 tpd, consists of four production lines, one for each paper or board machine. A total of 12 pressure grinders are tandem-driven by six 16,300-hp, 300-rpm motors. The grinders take 5-ft-long spruce logs. The whole PGW plant has five operators per shift, two of which take care of feeding the logs to the grinders.

Table 3 lists pulp test results for three types of mechanical pulps produced at the Anjala mill from the same raw material. The SGW is from the old groundwood mill, which has since been shut down and demolished. TMP comes from a 170-tpd plant operating at the site. PGW values are from early operations. Fine-tuning, startup of the computer control system, and tuning of the reject refining are expected to increase future PGW strength considerably.

At this stage, experience at Anjala has shown that the PGW pulp has improved paper machine operation. The mill reports that on No. 1 paper machine, kraft content

PHOTO B: Madison Paper's 280-tpd installation.

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has been reduced to 5% to 7% total. In spite of the reduced amount of chemical fiber, paper surface strength has been improved, and the average number of paper machine web breaks has been cut in half. The finished paper sheet has one to two points better opacity, and the surface is smoother.

In general, results of test runs in the pilot plant for the basic factors affecting the profitability of PGW (power consumption and pulp strength properties) have been shown to be correct in practice. The commercial mills are making stronger pulp than could be made at the original Anjala pilot plant. Optical and surface properties of PGW pulp have provided good paper printability, low show-through, and low linting propensity.

The improved pulp stone situation, grinder reliability, good economics, quality factors, and a wide raw material base all promise a bright future for PGW. ☐

FIGURE 1 **PGW tear strength vs raw pulp temperature. CSf level 80 to 120. Measurements according to scan standards**

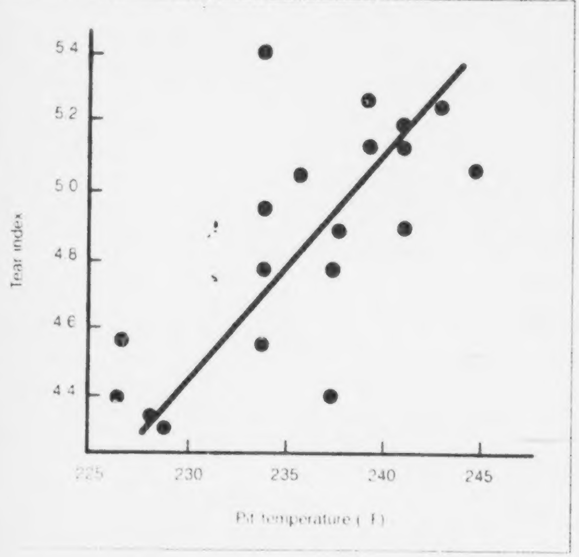


TABLE 2 **Specific power consumption of PGW and SGW processes in grinding**

PGW mill	Screened pulp CSf	Specific power consumption on grinders, hp-days/ton SGW	PGW
Holtzmann	95	58.7	57.7
Kajaani	110	56.1	56.1
Leykam	90	58.7	62.2
Myllykoski	55	68.9	64.3

TABLE 3 **Pulp testing results with different mechanical pulps from Anjala. Measurements according to scan standards.**

	PGW	TMP	SGW
CSf	100	90	100
Tear index	5.0	6.5	3.5
Tensile index	31	33	27
Burst index	1.5	1.8	1.1
Brightness	61	59	63
Light scattering	68	58	68
Hp-days/ton stones/refiners	64	94	61
Hp-days/ton plant total	75	115	71

BURNING WOODFIBER FUELS

(Continued from page 134)

Direct fired rotary. These systems fire 15% of the bark throughput, generally as fines, in a separate furnace; exhaust the hot products of combustion into a rotary dryer; and reduce bark moisture from, for example, 55% to 40%. These systems require a separate fluegas exhaust system and particulate emission control collector. Systems of this type are engineered and supplied by Stearns-Roger Engineering of Denver, Colo., and M-E-C of Neodesha, Kans.

Waste-heat dryers. Waste-heat contact dryers utilize hot fluegas from existing bark-fired boilers. These systems base drying performance on the reduction of fluegas stack temperature from a range of between 400°F and 500°F to an exit temperature of about 200°F.

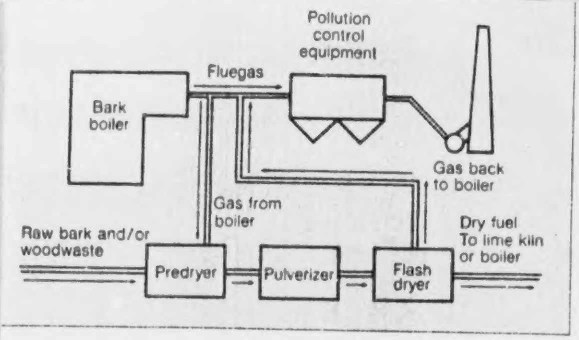
Systems in this category are engineered and supplied by the following companies: Bahco of Sweden (Figure 4); Carrier of Rexnord; Rader-Thompson of Beloit (Figure 5); and Flakt (Figure 6).

Indirect steam dryer. This system utilizes 150-psig turbine extraction steam in a series of 24-in.-dia shell and tube heat exchangers. Hogged bark passes through 6-in.-dia tubes. The bark steam vapor exhausts to the low-pressure mill system at approximately 60 psig.

Bark drying is an effective technique for reducing moisture in fuel, increasing boiler efficiency, and reducing fossil fuel demand. Several aspects of bark drying must, however, be considered in the dryer application:

- With moisture value in the range of 60%, as experienced in the Pacific Northwest, bark drying is a viable option. Reducing moisture content to 50%, for example, will lift grate capacity, reduce boiler fluegas volume, increase boiler efficiency, and reduce fossil fuel needs.
- Utilizing boiler fluegases is a viable option only when stack gas temperatures are in the 400°F to 500°F range. This can be the case for older, inefficient boilers.
- It is difficult to justify the application of a bark dryer for southern, 50%-moisture bark
- In modern, efficient bark boiler units with fluegas exit temperatures in the 300°F to 350°F range, there is insufficient temperature differential to justify waste heat bark drying
- The cost of a dryer system plus the cost of a boiler designed to fire dry bark will exceed the cost of a boiler designed to fire undried, 50%-moisture bark
- Bark dryers are, however, an effective means of extending and increasing the bark-burning capacity of existing bark-burning boilers. ☐

FIGURE 6: **Flakt bio-fuel system**


Pollution control equipment
Fluegas
Bark boiler
Gas back to boiler
Gas from boiler
Raw bark and/or woodwaste
Dry fuel To lime kiln or boiler
Predryer
Pulverizer
Flash dryer

Sodium sulfate demand recovering slowly in 1983

By BARRY SHOCKETT

Sparked by improving economic conditions, both total demand and pulp and paper usage of sodium sulfate should increase in 1983, although they are not expected to return to 1981 levels. Reduced output of byproduct sulfate in 1982 and plant closures produced a temporary shortage in domestic supply late in the year that was partially overcome by increased imports.

Byproduct sulfate output in Canada has not changed significantly in the last few years. Although total production was down about 2.5% in 1982, exports (mostly to the U.S.) reached a record level.

U.S. statistics, sodium sulfate (000 short tons)

	1980	1981	1982r	1983e
Capacity				
Natural	650	620*	470†	460*
Synthetic (byproduct)	600	600	600	600
Production				
Natural	583	608	450	405
Synthetic	556	536	480	540
Inventory change (year-end)	−4	−33	+26	0
Imports	230	291	391.5	435
Exports	129	124	111	120
Apparent consumption	1,236	1,278	1,236.5	1,260
Pulp and paper	593	613.5	593.5	608
Detergents	482	498.5	482	485
Other (glass and miscellaneous)	161	166	161	167

*40-kst plant closed April 1981; reopened January 1983
†200-kst plant closed March 1982
Sources: Bureau of Mines, U.S. Dept. of the Interior; Bureau of Census, U.S. Dept. of Commerce

Canadian statistics, sodium sulfate (000 short tons)

	1980	1981	1982	1983e
Capacity*	951	940	944.5	925
Production	653.5	698.5	681.5	678
Inventory change	−25.5	+3	+22	0
Imports	22	14	19	22
Exports	271	313.5	405.5	383
Apparent consumption	379	402	317	315
Pulping	291	313	237	231.5
Detergents	64.5	64	56.5	59.5
Other†	23.5	25	23.5	24

*Includes 107-tpy byproduct capacity
†Including glass, textiles, animal feeds, miscellaneous

SODIUM SULFATE

UNITED STATES

Uses: Sodium sulfate (saltcake) is the main source of makeup sodium and sulfur for kraft pulp mills. It is also used for detergents and by the glass industry.

Demand: In 1982, the pulp mill demand for sodium sulfate dropped to 593,500 tons, down 3% to 4% from 1981. Detergent applications consumed about 482,000 tons. Pulp mill demand is expected to increase slightly in 1983.

Sources: Three firms mine natural sodium sulfate—Great Salt Lake Minerals & Chemicals, Kerr-McGee Chemical and Ozark-Mahoning (div. of Pennwalt). The temporary shutdown of Great Salt Lake's plant in April 1981 and the permanent closure of Kerr-McGee's trona facility reduced the share of natural sulfate capacity to 44% of the total in 1982 (from 52% in 1980). The major byproduct (synthetic) sulfate producers are Allied Chemical, Avetex, Climax Chemical, Diamond Shamrock, Koppers, and Morton Salt Div.

Availability: If the rayon, chrome chemicals and lithium industries' output increases, thus raising byproduct production, no shortages should occur. 1983, tight to market; 1982, market to tight; 1981, market; 1980, tight to market.

Pricing: On Jan. 1, 1983, list prices of saltcake rose $5/ton to $99/ton on the West Coast and $91/ton in the South. Canadian saltcake for export to the U.S. also rose Jan. 1 to C$82/ton, f.o.b. mine. Price history: 1982, $79-$94/ton; 1981, $68-$79/ton; 1980, $60-$68/ton.

Forecast: Byproduct sulfate production is predicted to increase substantially in 1983 as the economy improves. Sodium sulfate output is expected to rise modestly.

CANADA

Uses: Kraft pulp mills consume most of the saltcake in Canada.

Demand: Pulp mills consumed about 237,000 tons of saltcake in 1982, vs the 313,000 tons reportedly purchased by the mills in 1981. Mill demand is forecast to drop 5,500 tons in 1983.

Sources: Five natural sulfate producers who account for 88% of capacity (in descending order of nameplate) are Saskatchewan Minerals, Sodium Sulfate Div.; Hudson Bay Mining & Smelting's Francana Minerals Div.; Midwest Chemicals; and Alberta Sulphate and Ormiston Mining & Smelting with the same capacity.

Availability: The available surplus can handle domestic demand, despite increased exports. 1982, market; 1981, market; 1980, market; 1979, market.

Pricing: The price of omestic saltcake held steady for a year at $75/ton until a $6/ton boost on Apr. 1, 1983. Pricing history: 1982, $70-$75/ton, bulk, f.o.b. producing point; 1981, $55-$70/ton; 1980, $50-$55/ton; 1979, $50/ton.

Forecast: Pulp and paper's share of total sulfate demand is expected to dip slightly to 74% (77% in 1980) in 1983. In the longer term, use by mills should decrease, on average, about 2%/year to slightly less than 210,000 tons in 1987.

Mr. Shockett is consulting editor-chemical markets for PULP & PAPER.

PULP & PAPER
July 1983

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Pulpwood Processing

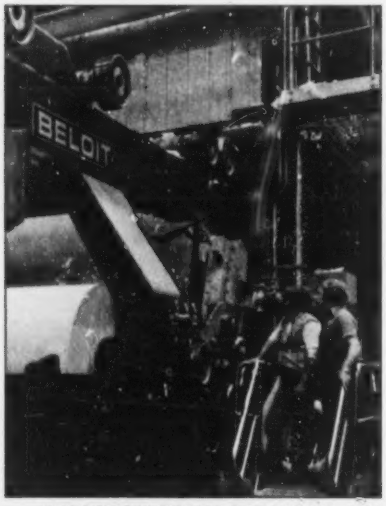
Wisconsin Tissue Mills adds capacity at Menasha, Wis. 108

PULP&PAPER

Volume 57 **Number 7** **July 1983**

PULPWOOD PROCESSING

PROCESS AUTOMATION **89**



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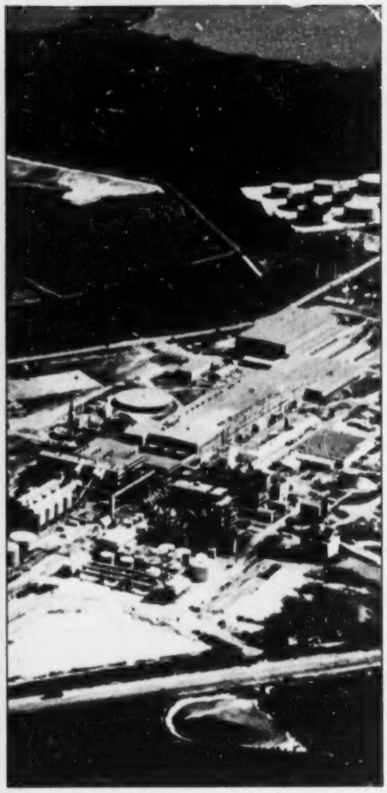

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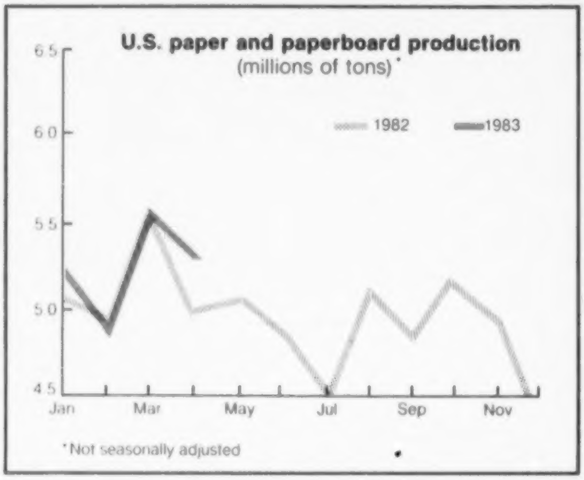
MONTH IN STATISTICS

U.S. paper and paperboard production in April totaled 5.2 million short tons, up 4.5% over year-earlier levels, according to the American Paper Institute. The March-April two-month moving average of seasonally adjusted data on paper and paperboard production was at 61.5 million tpy, and for the first four months of the year was at 61.9 million tpy.

Among major grades for the first four months of 1983, printing/writing grades were particularly strong, specifically in coated paper and uncoated free-sheet grades. Newsprint production, however, was relatively weak in April, bringing the four-month total some 3.6% below that of 1982. Production of paperboard has followed a pattern similar to that of the total industry, with the rate of production in each month of the January-April period holding within 1.4% of its average level. For the four-month period, paperboard output was 3.8% ahead of the same period in 1982.

Total Canadian newsprint shipments totaled 712,000 metric tons in April, up 1.0% from a year ago, according to the Canadian Pulp & Paper Assn. Newsprint mill operating rates were 82% in April, compared with 84% in April 1982.


U.S. paper and paperboard production
(millions of tons)*

*Not seasonally adjusted

		Latest month (000 short tons)	% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION[1]					
Newsprint	April	400	−8.5	5,127	−3.6
Uncoated groundwood (s)	April	127	3.3	1,404	−0.3
Coated paper (s)	April	431	5.4	5,276	7.4
Uncoated free sheet (s)	April	738	11.3	8,626	8.1
Unbleached kraft packaging and industrial (s)	April	290	−0.3	3,723	−3.4
Tissue	April	385	7.5	4,627	3.4
Total paper	**April**	**2,635**	**4.4**	**31,904**	**2.9**
Kraft linerboard, unbleached	April	1,233	6.5	14,526	5.9
Semichemical medium	April	385	4.1	4,522	0.9
Bleached paperboard	April	330	4.4	3,878	2.4
Recycled paperboard	April	569	1.6	6,975	4.1
Total paperboard	**April**	**2,607**	**4.7**	**30,915**	**3.8**
Total paper and paperboard*	**April**	**5,242**	**4.5**	**62,819**	**3.3**
PULP, WASTEPAPER & FIBER[2]					
Total woodpulp production	March	4,572	−0.5	51,465	0.4
Market pulp production	March	577	7.6	6,038	1.2
Wastepaper consumption at paper/board mills	March	1,251	1.3	14,136	4.2
Pulpwood consumption (cords)	April	7,360	4.9	84,504	6.0
CONVERTED PRODUCTS STATISTICS[3]					
Corrugated box shipments (billion ft^2)	April	20.466	2.6	81.052†	2.9
Containerboard inventories at box plants	Apr. 1	2,414	−6.1		
INTERNATIONAL TRADE[2]					
U.S. paper imports (including products)	March	736	4.8	7,654	−1.7
Imports of Canadian newsprint	March	612	1.5	6,042†	−7.2
U.S. paper exports (including products)	March	348	−13.4	4,244	3.7
Exports of unbleached kraft linerboard	April	184	21.1	2,149	10.8
Exports of woodpulp	March	332	4.1	3,139	−1.6
CANADIAN STATISTICS[4] (reported in metric tons)					
Total newsprint shipments	April	712	1.0	2,597†	−7.7
Operating rates	April	82%	84%	82%	92%
Inventories held by U.S. consumers	Apr. 30	1,234	−24.3		
Woodpulp shipments (export only)	April	1,415	−1.5	5,892†	−5.1
Operating rates	April	72%	77%	79%	85%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fiber Box Assn., Paperboard Packaging Council. 4. Canadian Pulp & Paper Assn. *Includes construction and wet machine grades. †Not annualized. ‡Not directly comparable to year ago because of coding change. (s) = shipments

LABOR

Negotiations begin in B.C.

Labor talks began in British Columbia on May 31 with the Canadian Paperworkers Union and the Pulp & Paperworkers of Canada, while the International Woodworkers of America started negotiating on June 2.

Both sides appeared to be far apart in their goals for negotiations this year, but sat down to the bargaining table with similiar attitudes concerning restoring the economic health of the industry.

Art Gruntman, CPU vice president for western Canada, said the union does not expect to get the generous settlement negotiated in 1981. That contract, which expires June 30, gave wage increases of 15% in the first year and 13% in the second, boosting the hourly base pay to C$11.46 in 1981 and C$12.96 in 1982.

Western Canadian workers' wages are significantly ahead of their eastern Canadian counterparts, who began earning C$12.52 in base hourly pay following a 10% hike effective May 1. Wage rates of West Coast U.S. workers are also high, averaging US$11.05 last year, while those in the South were only U.S.$8.56, with most first-year settlements this year in the 6% to 7% range (see table).

British Columbia employers, who are represented by the Pulp & Paper Industrial Relations Bureau and by the Forest Industrial Relations Ltd., are seeking a three-year contract with no cost increase in the first year.

The Canadian Paperworkers Union wants a one-year contract with a 12% pay hike and a four-hour reduction in the work week, as well as improvements in the pension plan and other benefits.

As talks began in May, both sides appeared adamant about at least two of the issues. Neither side wanted to change its proposal for the length of the agreement, and the CPU refused to consider the companies' request that employees be given the option of working during at least part of their vacations.

If a one-year term is approved, West Coast contracts will expire two months after the present agreements covering most of the industry in eastern Canada.

Pulp and paper industry base wage rates by region

	Canada		United States	
Year	B.C.	Eastern	South	West
1983	—	C$12.52	—	—
1982	C$12.96	11.38	$8.56	$11.05
1981	11.46	10.16	7.91	9.37
1980	9.96	9.23	7.28	8.53
1979	9.06	7.89	6.74	7.90
1978	8.16	7.46	6.13	7.25
1977	7.61	6.99	5.57	6.59
1976	6.89	6.47	5.04	5.96
1975	6.14	5.88	4.58	5.26
1974	5.10	4.57	4.15	4.78
1973	4.45	4.21	3.78	4.32
1972	4.09	3.85	3.48	4.02
1971	3.80	3.51	3.28	3.76
1970	3.50	3.25	3.09	3.45

Source: P&P Factbook, 1982-83

Strike ends at Scott Maritimes

Canadian Paperworkers Union members on strike at Scott Maritimes Ltd.'s pulp mill in Abercrombie Point, N.S., since Sept. 10, 1982, have ratified a new two-year contract. The 630-tpd bleached kraft mill, idle during the 37-week walkout, was expected to start up the first week in June.

The new agreement calls for wage increases of 12%/10% and improvements in the pension plan and other benefits. In addition, it allows the company greater flexibility in scheduling overtime and restarting the mill after shutdowns, said a union spokesman. The company declined to comment.

The union struck because Scott wanted to take back some of the gains made by the union in the old contract, an observer said. Although the company did get greater leverage in some areas, the union considered the new pension plan a "good breakthrough," and the wage settlement is in line with others in the industry, a union executive said.

The new contract was approved in voting on May 30, 18 days after workers turned down the offer by a vote of three to one. Observers said employees were persuaded to settle the strike after the company decided to prepare the mill for an "extended shutdown" and to indefinitely delay completion of a C$51.7-million modernization.

- United Paperworkers International Union workers at **James River Corp.**'s Ashland, Wis., mill and nearby converting operations were expected to reject the company's latest labor contract offer and vote to serve a required six-day strike notice, said a company executive. No further talks between the two sides had been set.
- **Procter & Gamble Products** has reached a new three-year labor agreement with 1,532 UPIU employees at the company's Green Bay, Wis., mill. The contract, which expires Apr. 30, 1986, calls for pay hikes of 6% each year.

UPIU to fight IP's labor tactics

Claiming International Paper Co. has had a "hostile and antagonistic approach" in its relations with the United Paperworkers International Union, the union plans to change that relationship, according to UPIU president Wayne Glenn.

In a union publication, Glenn said, "The UPIU Corporate Campaign will hold IP and all its supporters accountable for the deterioration of labor relations we now experience."

The union is compiling a list of all businesses in any way associated with IP, including investigating the affiliations of the company's directors, and is asking its members for suggestions on how to coerce IP into meeting its goals.

The goals of the union are to get IP to negotiate contracts promptly, to remain neutral when workers attempt to organize unions at IP's mills, and to handle worker grievances effectively and "foster an atmosphere conducive to meaningful negotiations," said the news item.

IP chairman Dr. Edwin A. Gee remarked at the annual company meeting that the company's labor policy is based on three principles: treating all its workers "fairly and with respect," recognizing "the right of all our employees to join a union or represent themselves" and following "normal legal requirements" in its labor relations.

Recycled paperboard:

Market improves slowly; starts with low grades

Statistics:	**1981**	**1982**	**1983e**
Production, 000 tons[1]	7,001	6,476	6,975
Capacity, 000 tons	8,593	8,731	8,920
Utilization rate, %	82.3	74.2	78.2
Imports, 000 tons	30	32	47
Exports, 000 tons	174	149	140
Apparent U.S. consumption			
000 tons	6,926	6,508	7,022
lb/capita	60.3	56.2	56.4
000 tons/$ billion real GNP (1972)	4.59	4.40	4.64

[1] American Paper Institute data

Grade structure: Recycled paperboard usually consists entirely of wastepaper and is produced on both fourdrinier and multi-ply paper machines. Grades are generally divided into three categories: folding boxboard, setup boxboard, and paperboard. Most folding boxboard is clay-coated, while setup boxboard is uncoated. Recycled paperboard includes corrugating medium, linerboard, gypsum linerboard, and core, can and tube stock but not any construction papers or boards.

Production/capacity: Production declined 7.5%, to 6.48 million tons in 1982 from 7.0 million tons in 1981.

Discounting was rife in the market last year as producers attempted to maintain orders while demand deteriorated in line with the lag in the general economy worldwide.

Clay-coated paperboard consumption, however, reportedly gained some folding carton market share at the expense of solid bleached sulfate paperboard as customers downgraded to lower costs. But demand for chipboard and other lower recycled grades was weak, keeping down the market overall.

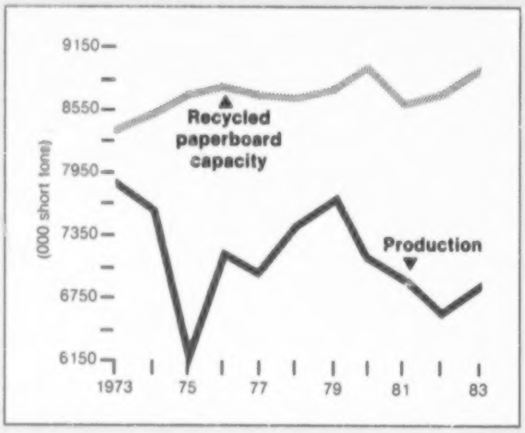
Exports of recycled paperboard were off 14%, to 149,000 tons in 1982 from 174,000 tons in 1981—consistent with the decline that began at the start of the decade.

Recycled paperboard capacity, also declining in recent years, is now on the way up. Expansions totalling 418,000 tons and representing an average annual increase of 1.6%, will raise total capacity to 8.6 million tons in 1982 and to 9.1 million tons in 1985. In the past 12 years, 2.5 million tons of capacity has been eliminated, although most of it has been offset by incremental expansion of existing machines.

Whippany Paper Board Co.'s recycled mills in Whippany and Clifton, N.J., have remained idle since the company declared bankruptcy in 1980, but the Whippany site could be sold this year if Container Corp. of America exercises its option—which expires Jan. 1, 1984—to buy that mill.

Outlook: Recycled paperboard markets began to improve in the second quarter with the lower grades being bolstered by a pickup in construction. Recycled production in 1983 is expected to reach 6.98 million tons, 5.3% higher than last year. Operating rates should rise to 78%, vs 74% in 1982.

Prices for the lower grades such as chipboard and whitelined vat began to firm toward midyear, with several companies announcing price increases that appeared to be gaining widespread customer acceptance. Clay-coated markets, however, remained depressed and were not expected to rebound until the last quarter of 1983.



Estimated capacities of major U.S. companies are:

	Annual capacity (000 tons)	**Capacity share** (%)
1. Container Corp. of America	753	8.4
2. Sonoco Products Co.	555	6.2
3. Jefferson Smurfit	500[1]	5.6
4. Whippany Paper Board Co.[2]	454	—
5. National Gypsum Co.	417	4.7
6. U.S. Gypsum Co.	347	3.9
7. Caraustar Industries[3]	325	3.6
8. Packaging Corp. of America	318	3.6
9. Newark Group	300	3.4
10. St. Regis Paper Co.	295	3.3
11. Federal Paper Board Co.	281	3.1
12. Rock-Tenn Co.	210	2.3

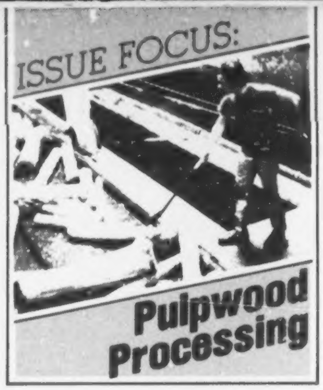
U.S. capacity (1983): **8.920 million tons**
Capacity share of top five companies: 32.2%
Capacity share of top ten companies: 49.9%

[1] Includes Alton Packaging and Diamond-Smurfit.
[2] Two of the company's mills in Clinton and Whippany, N.J., have remained closed since Whippany declared bankruptcy in 1980. Container Corp. of America has an option to buy Whippany's Eden mill in Whippany, however.
[3] Holding company with ownership in Austell Box Board, Sweetwater Paper Board, Carolina Paper Board, and Carotell Paper Board.
[4] Excluding Whippany.

Pricing: Clay-coated 20-pt folding boxboard (rolls) price history in $/short ton (year-end) is: 1975, $257; 1976, $262; 1977, $284; 1978, $305; 1979, $355; 1980, $400; 1981, $425; 1982, $340-380*; June 1983, $340-380*.

Bending 20-pt chipboard (rolls) in $/short ton (year-end) is: 1975, $204; 1976, $212; 1977, $219; 1978, $225; 1979, $260; 1980, $275; 1981, $280; 1982, $240-280*; June 1983, $280. (*Indicates the estimated regular transaction prices after discounting has occurred.)

Markets: Approximate market demand for the various recycled paperboard grades as measured by their capacity share is as follows: folding boxboard, 29.7%; setup boxboard, 3.7%; corrugating medium, 16.5%; gypsum linerboard, 14.3%; linerboard, 6.5%; container chipboard and filler board, 3.5%; other paperboard, 25.7%.



Growth rate of Southern forests to rise further through year 2000

Recent rapid increases in forest growth are due to events such as abandonment of farmland and soil bank plantings in the late 1950s

By ROBERT W. HAGLER

■ In the past 10 to 15 years, forestland owners, foresters, and industry managers alike have watched forest growth rates over much of the southern U.S. accelerate at a phenomenal pace. From 1969 to 1979, the net annual growth of timber in northeastern Florida increased from an average of 39 ft^3/acre/year to 63 ft^3/acre/year. The entire state of Virginia increased its rate of forest growth per acre by more than 50% between 1966 and 1977, while southeastern Georgia increased its growth per acre from 56 ft^3 to 77 ft^3 during the 1970s.

Under sustained yield management, these increases have cleared the way for substantially higher levels of forest utilization. As unexpected as these increases in growth have been, they have proven necessary to support the tremendous expansion of southern capacity in the pulp and paper and solid wood products industries that has taken place over the same period. In fact, Arthur D. Little Inc. estimates the overall softwood growth/removal ratio in the South dropped only marginally between 1970 and 1980. The question is: can we expect this historical trend to continue and, if so, how far will it go? This article is intended to create an understanding of the historical events leading to this supply situation, analyze current events, and project what the future may hold for the southern timber supply.

WHAT HAPPENED? The reasons behind the tremendous increases in growth rates in the last few years lie, in part, in the way the U.S. Forest Service estimates annual growth. Forest resources are surveyed in the South approximately every 10 years (although surveys may be less frequent in the future because of recent reductions in operating budgets). Permanent plots are remeasured during the survey time, and estimates of commercial forestland characteristics are made based on statistical sampling procedures. Timber growth is usually estimated using this system of periodically remeasuring such permanent sampling plots. However, only trees greater than 5.0 in. dbh (diameter breast height) are measured. In an area where a large volume of stems becomes merchantable (more than 5.7 in. dbh) between two surveys, the reported growth in that area will show a substantial increase in both volume/acre and growth/acre. Growth rates, therefore, have a tendency to increase in large steps as a result of large slugs of ingrowth in a particular region as young trees attain the required size.

Consequently, it is not the increased concern for the environment, private landowner assistance programs, capital gains tax incentives, or government reforestation efforts during the 1970s that led to the dramatic increases in growth rates previously mentioned. It was the result of events in the 1950s and early 1960s that led to reforestation of vast areas (primarily with softwood) which then became merchantable during recent decades. These events deserve a closer look.

EVENTS OF THE PAST. By far the most important source of additional forestland and growing stock that has appeared in the South in the past 30 years is abandoned farmland. This demographic event began in earnest after World War II, as the general population migrated to urban areas and old fields began to naturally reseed to predominantly pioneer stands of loblolly and shortleaf pine. At its peak, up to 3 million acres/year were being taken out of agricultural production and the process of natural succession back to forest was begun. If only half of this land seeded to pine (a conservative estimate considering geographic location and soil condition), an additional 1.5 million acres/year of relatively even-aged pine stands would have been established.

The event of farmland abandonment began to subside in the late 1950s, and by about 1965 had begun to reverse itself. Since then, the South has annually lost commercial forestland to higher value-added alternative uses such as urbanization and agriculture. This trend is expected to continue through the rest of this century.

The second major event to take place during this period was the Soil Bank Reforestation Program between 1956 and 1963. In these seven years, more than 2 million acres of generally unproductive land were planted with

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Mr. Hagler is with Arthur D. Little Inc., Cambridge, Mass.

pine seedlings. Many more acres were artificially reseeded. Although the major thrust of the program was soil stabilization, its primary legacy was the establishment of millions of acres of pine forests that would materially affect the competitive situation of the region's forest products industry nearly two decades later. It is interesting that forest industry planting and seeding activities in the South increased substantially over this period, from about 120,000 acres annually in 1950 to nearly 550,000 acres in 1961. A major lull in reforestation efforts occurred at this point, and not until 1970 did the industry again top the 550,000-acre mark.

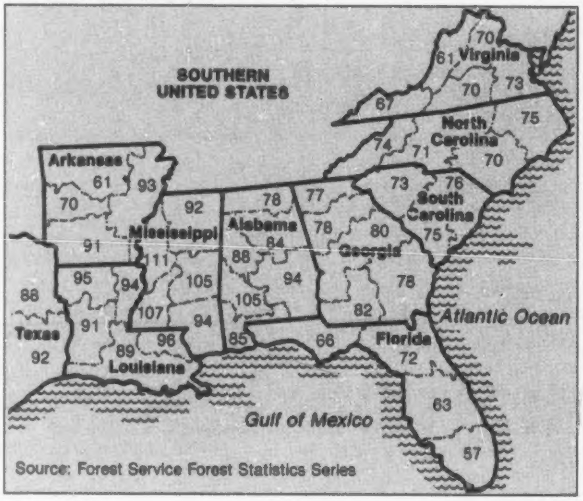
Before 1965, softwood stand establishment components included farmland abandonment; public and forest industry activities; and Soil Bank plantings by nonindustrial private owners (NIPOs), which had a substantial effect. By the early 1960s, the importance of these components had shuffled to the point where forest industry activity had become the predominant method of pine stand establishment. NIPO planting and seeding activities dropped to much lower levels than in prior years, while pine establishment on public lands remained fairly constant throughout. The drop in stand establishment that began in the early 1960s may have a dramatic impact on the availability of softwood timber through the 1980s and 1990s. It has already begun to show up in recent U.S. Forest Service survey counts of the number of 2- and 4-in. trees. These are down in recent surveys in Florida (1980) and southern Georgia (1981), by roughly 20% and 46%, respectively.

WHAT DOES THE FUTURE HOLD? The forces behind increased growth rates in recent years are clearly evident. At the same time, new questions arise. Will the trend toward higher growth rates continue? Could statewide growth rates in excess of 100 ft^3/acre/year be seen by the next set of forest surveys? In general, the answer is no.

The natural potential for timber growth is far from evenly distributed in the southern states. Figure 1 shows the weighted growth potential per acre in each of 43 survey units derived from U.S. Forest Service site classification data. Such data are a valuable tool when used to compare the potential productivity of state and regional areas. As might be expected, growth potential is lower in mountain and upland areas than in the more ideally suited regions of Alabama and Mississippi. Since this growth potential is based on fully stocked natural stands, areas that are heavily planted to plantations may actually exceed these growth potential estimates by as much as 10%. Throughout the entire South, however, the average growth was estimated in 1980 to be about 83% of the overall natural growth potential.

"Natural growth potential" defines a practical limit on the increasing growth rates seen in recent years. In particular survey units, such as the piedmont of South Carolina and southwestern Georgia, this limit has already been reached and further increases in growth will be minimal. Many survey units, however, such as northwestern Florida and the southern coastal plain of North Carolina, have considerable room for improvement. Some areas may never reach their maximum growth potential because of ownership patterns and lack of forest management. Clearly, the potential for increased forest growth and utilization is site-specific. Accuracy of projections is diluted as wider regions are considered and local considerations such as the economical accessibility of timber growth are ignored. Still, a survey unit analysis supports the conclusion that some parts of the South have far more unutilized potential than others.

FIGURE 1: **Weighted natural forest growth potential of southern survey units** (ft^3/acre/year)



Source: Forest Service Forest Statistics Series

Having established that there is a practical limit to forest growth—already reached in some parts of the South—the question remains: what does the future hold for growth rates in the South? Forest growth projections in a given area can be estimated with reasonable confidence after careful consideration of four key factors:

1. Changes in the commercial forestland base due to agriculture, urbanization, etc.
2. Changes in the growth rate of trees as genetically improved first- and second-generation superior trees are planted and increase yields.
3. Changes in the growth/acre ratio between hardwood and softwood as many unmanaged stands revert to hardwood because of failure to replant softwood, selective harvesting, and lack of natural fire. At the same time, industry-owned lands continue to be converted from natural mixed stands to pine plantations.
4. Changes in growth/acre as inventories build up toward full stocking because of a continued surplus of growth above removals in many areas.

Growth/acre (softwood and hardwood) averaged about 67 ft^3/acre/year over the entire South in 1980. This is projected to increase to nearly 80 ft^3/acre/year by the year 2000. However, because of a smaller commercial forestland base (5% to 10% smaller by the year 2000) only marginal additional growth will be available in the South for utilization and subsequent new facility construction and expansion.

Supply of forest resources for utilization in the wood products industry is primarily a function of history. The South owes much of its recent gains in growth and stocking levels to events of the 1950s and '60s. Counterproductive trends and a lack of similar events during the late 1960s and '70s will result in only marginal increases in softwood growth through the end of this century. While broad regional comparisons are valid, estimates of future available supply in any one area must consider local characteristics such as geography, species mix, ownership, stand size and accessibility, growth rates, and locally unique wood demand characteristics. ■

TABLE 1: **Total wastepaper recovered by grade—1970 to 2000 (000 short tons)**

Year	Total[1] wastepaper recovered	Grade of wastepaper recovered				
		Mixed	News	Corrugated	Pulp[2] substitutes	High-grade[2] deinking
1970	12,562	2,749	2,445	4,235	2,282	851
1975	13,072	2,822	2,416	5,083	1,949	803
1980	18,051	2,862	3,359	8,062	2,450	1,318
1985	20,735	3,230	3,775	9,520	2,620	1,590
1990	23,960	3,505	4,350	11,305	2,835	1,965
2000	30,590	4,020	5,465	15,370	3,220	2,515

[1] Total wastepaper recovered is the sum of wastepaper used in the paper industry, other uses, and exports less imports.

[2] Pulp substitutes and high-grade deinking prior to 1976 were allocated by Franklin Associates Ltd. on the basis of 1976 data; prior to that the American Paper Institute data combined the two categories.

Source: Franklin Associates Ltd.

TABLE 3: **Estimated wastepaper exports by country of destination—1985 and 1990**

Major export markets	1980	1981	1985e	1990e
South Korea	407,800	518,200	542,800	666,600
Taiwan (China)	370,200	386,100	428,600	454,800
Japan	201,400	84,000	181,300	201,400
Canada	450,800	356,500	464,400	488,000
Mexico	588,500	346,000	701,710	820,300
Italy	199,300	114,100	219,200	239,200
Venezuela	166,300	128,700	104,700	93,000
Other countries	329,400	278,900	418,800	421,700
Total	2,644,300	2,212,500	3,061,510	3,485,600

Source: Franklin Associates Ltd.

Wastepaper consumption to rise

Global expansion of paper industry, along with anticipated startup of numerous resource recovery plants, will pressure wastepaper supply

By DEBRA A. ADAMS, News Editor

■ Consumption of wastepaper will increase during the 1980s and 1990s because of greater demand from domestic mills as well as from foreign countries where paper industries are growing, according to study done recently by Franklin Associates Ltd. for the American Paper Institute. Recyclable paper supplies, meanwhile, could be threatened by municipal waste-to-energy resource recovery plants starting up in the U.S. during this time.

More secondary fiber and proportionally less virgin pulp will be used in the next 20 years as a result of worldwide pulp capacity not keeping pace with demand, according to the study, *Waste Paper—the Future of a Resource, 1980-2000.*

Moreover, growth in the lumber industry is expected to be only slight, or even flat, due to the reduced housing activity anticipated for the next two decades. This will reduce the amount of wood residues available for pulping and put additional strains on recyclable paper, the study notes.

WASTEPAPER USAGE TO INCREASE. Use of wastepaper as a raw material in domestic mills increased 29% during the 1970s, with corrugated box plant cuttings and old corrugated containers being the dominant grade consumed. This trend is expected to continue, although Franklin Associates sees paperboard mills actually consuming slightly less recyclable fiber until 1990 and then beginning to gradually increase orders to reach only the 1970 level by the year 2000.

The forecast for pulp substitutes and high-grade deinking grades indicates only a slight increase in U.S. consumption during the next two decades. Use of wastepaper in newsprint and tissue grades should continue to rise but at a slower pace than in the 1970s. More old newspapers will be used as a result of more deinking mills being built, and tissue mills are expected to consume 2.75 million tons of wastepaper in 2000 compared to 1.7 million tons in 1980.

U.S. WILL REMAIN MAJOR MARKET. U.S. wastepaper exports are expected to increase to 4.45 million short tons by 2000, from 2.644 tons in 1980, with Mexico and Korea being major consumers. Considerable fluctuations could occur in various countries' buying patterns during this time, but the impact on the overall market is expected to be minimal as variations are likely to offset each other, according to the report.

Foreign countries are likely to continue to depend on the U.S. as their major source of wastepaper in the next two decades since demand usually grows faster than recyclable paper can be generated, the study notes. Expansions of recovery systems also may be impractical for these countries. In addition, containerized shipping and favorable freight rates will continue to make U.S. wastepaper prices attractive on many heavily traveled routes.

Higher domestic wastepaper recovery rates will be required to keep up with increased export demand. Nationally, the recovery rate is expected to rise to 28.7% by 2000, from 26.3% in 1980. The greatest growth in recov-

TABLE 2: **Wastepaper utilization in total paper, paperboard, and construction paper—1970 to 2000 (000 short tons)**

	Grade of wastepaper utilized					Total wastepaper utilized	
Year	**Mixed**	**News**	**Corrugated**	**Pulp[1] substitutes**	**High-grade[1] deinking**	**Tons**	**%**
1970	2,639	2,235	4,080	2,216	851	12,021	23.2
1975	2,605	2,040	4,744	1,792	803	11,983	23.4
1980	2,268	2,564	6,866	2,254	1,142	15,094	23.7
1985	2,400	2,905	8,220	2,420	1,410	17,355	23.6
1990	2,555	3,420	9,825	2,605	1,755	20,160	24.4
2000	2,780	4,385	13,490	2,920	2,245	25,820	24.9

[1] Pulp substitutes and high-grade deinking prior to 1976 were allocated by Franklin Associates Ltd. on the basis of 1976 data; prior to that the American Paper Institute data combined the two categories.

Source: 1970 to 1980 data from API; 1985 to 2000 data from Franklin Associates Ltd.

TABLE 4: **Fibrous materials used in the paper industry—1950 to 2000 (%)**

Year	Roundwood	Wood residues	Total woodpulp	Wastepaper	Other fibers
1950	60	4	64	31	5
1960	59	13	72	25	3
1970	55	22	77	21	2
1980	46	30	76	23	1
1990	44	32	76	23	1
2000	43	32	75	24	1

Source: Franklin Associates Ltd.

worldwide through year 2000

ery rates is slated to occur in old newspapers and old corrugated containers.

Recovery of old newspapers will rise to between 31% and 40%, or 5.5 to 7 million tons in 2000, from 28.5%, or 3.3 million tons in 1980. The recovery rate for corrugated could rise so high it could depress prices in some areas by 2000, when it is projected to rise to between 47% and 50%, or 12.3 to 14.6 million tons, from 40%, or 6.3 million tons in 1980.

TYPE OF FURNISH SWINGS. The amount of wastepaper recycled in the U.S. will outpace total paper production in the mid- to late-1980s, Franklin Associates reported. The utilization rate is expected to increase to between 23.7% and 26.5%, or 25.8 to 28.8 million tons, by 2000 from 22.8%, or 15.1 million tons, in 1980. ,

Wastepaper will comprise approximately 23.7% of the raw materials used to produce an estimated 108.9 million tons of paper and paperboard in the U.S. by 2000, compared with 22.8% of the fiber furnish used to make 66.1 million tons in 1980, the study indicates. In the same period, woodpulp as a percentage of furnish will drop to 75.3% from 76% and use of other fibers will remain at about 1%.

Old corrugated containers will remain the predominant grade of secondary fiber consumed, increasing to 13.5 million tons in 2000 from 6.9 million tons in 1980. Old newspaper demand will rise to 4.4 million tons from 2.6 million tons. Orders for pulp substitutes and deinking grades will not increase as rapidly.

MILLS TO USE MORE CORRUGATED. Recycled paperboard mills have traditionally consumed a tremendous amount of wastepaper, particularly corrugated, but flat or slow growth in this segment should not put much pressure on wastepaper supplies in the next two decades. Mills are expected to buy 9.9 million tons of wastepaper by 2000, compared with 7.7 million tons in 1980.

Corrugated used in unbleached kraft paperboard production during the 1970s increased just 4% to 6% but is forecast to grow to 16% by 2000. Large mills, particularly those in the South, have found that using corrugated is a cost-effective way to increase their output. Research on the use of corrugated continues and could result in even higher demand for corrugated from this segment of the industry, according to Franklin Associates.

Semichemical paperboard mills are expected to increase their use of wastepaper to 25% by 2000 from 20% in 1980, with a swing toward more corrugated and less box plant cuttings as mills install more sophisticated cleaning equipment.

Old newspaper consumption will be spurred by an increase in the number of deinking mills, according to the study. By 2000 it is estimated that there will be 10 or 11 newsprint machines producing deinked newsprint and numerous virgin fiber mills using supplemental furnish for producing newsprint.

Currently, four mills make deinked newsprint from old newspapers and two mills use a significant amount of deinked news with virgin fiber in making newsprint. The percentage of old news used in domestic production is forecast to rise to 25% in 2000 from 19.2% in 1980.

MUNICIPAL COMPETITION. Wastepaper represents an estimated half of the energy value in residential and commercial waste. About 200 communities are considering building resource recovery plants to dispose of solid waste. It is uncertain how feasible these facilities

TABLE 5: **Disposition of paper in U.S. solid waste—2000 (000 tons)**

Category	Wastepaper generated[1]	Diverted or destroyed[2]	Net wastepaper[3]	Uncollected[4]	Available for recovery or disposal[5]	Source separated and recovered 10^3 tons	Source separated and recovered % of available	Energy recovery[7] 10^3 tons	Energy recovery[7] % of available	Collected and disposed[8] 10^3 tons	Collected and disposed[8] % of available
Old newspapers	17,588	88	17,500	3,145	14,355	5,100	35.5	1,740	12.1	7,515	52.4
Old corrugated containers	27,800	0	27,800	5,000	22,800	11,400	50.0	1,970	8.6	9,430	41.4
All other paper and paperboard	49,062	13,727	35,335	6,355	28,980	3,840	13.3	5,280	18.2	19,860	68.5
Total paper and paperboard	94,450	13,815	80,635	14,500	66,135	20,340	30.8	8,990	13.6	36,805	55.6

1. Paper, paperboard, and other products after residential or commercial end-use. Does not include converting scrap.
2. Disposed into sewer system, stored in libraries, used in buildings, or otherwise diverted from recovery or disposal.
3. Paper not destroyed or permanently diverted.
4. Estimated amount which is self-disposed (e.g., on farms, by commercial establishments), littered, or otherwise does not go into the waste stream collected and disposed in an organized system.
5. The paper waste which could be presorted before being discarcded, recovered from the waste stream, or disposed of.
6. Paper recovered by individuals, groups, and public or private collectors for recycling. Does not include converting scrap.
7. Does not include energy recovery on-premise by private organizations.
8. Disposal would most commonly be landfill, but could be incineration without energy recovery.

Source: Franklin Associates, Ltd.

would be to operate, considering five were closed in 1982. But, the more that are opened, the greater will be the competition among private and public sources for a share of recyclable paper supplies.

Problems were already encountered in Akron, Ohio. A case is now being fought in federal court to decide whether that city has the right to require that all garbage be dumped at the resource recovery plant. This landmark case will likely affect the rights of private haulers to have access to the solid waste stream in the future.

This concern among recyclers that municipal waste-to-energy plants could monopolize the solid waste stream is somewhat allayed in the report. Franklin Associates forecasts that energy recovery plants will process about 15.5 million tons of solid waste in 1990 and 29 million tons by 2000. This is not expected to cause problems nationally, but competition in some areas could result in shortages of some grades. ■

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Pulp mill soda ash use stable in 1983

By BARRY SHOCKETT

Domestic demand in the U.S. for soda ash, or sodium carbonate (Na_2CO_3), has been near the 8.3-million-ton mark since 1979, but in 1982 dropped to about 7.86 million short tons. In conjunction with increased capacity, this has forced producers to look for other markets to develop. These include the use of Na_2CO_3 to reduce coal-fired-boiler SO_2 emissions and acid rain neutralization. Both of these markets, however, require time to develop. The area of export sales also has significant potential, as shown by an increase in exports to Japan in early 1983.

In the first two months of 1983, 52,500 tons were shipped to Japan compared with 32,000 tons for 1982. Soda ash demand in Canada also dropped in 1982, since the glass, chemical, and paper industries all had decreased sales.

U.S. statistics, sodium carbonate (000 short tons)

	1979	1980	1981r	1982e
Capacity	10,100	9,620	10,360	10,540
Production	8,253	8,275	8,281	7,862.5
Imports	40	18.3	11.8	18
Exports	997	1,094	1,050.5	1,108.5
Apparent consumption*	7,306	7,131.5	7,146.5	6,676.5
Glass**	3,995	3,780	3,790	3,538.5
Chemicals	1,686	1,426.5	1,420	1,400
Pulping	252	250	250	233.5
Other†	1,373	1,675	1,718	1,505

*Includes inventory adjustments.
**Including containers, sheet and fibers.
†Including water treatment, detergents, and miscellaneous.
Source U.S. Bureau of Mines: Bureau of Census, Dept. of Commerce.

Canadian statistics, sodium carbonate (000 short tons)

	1979	1980	1981	1982e
Capacity	441	441	441	441
Production	410	423	419	419
Imports	202	178	153	134.5
Exports	39	18	11.8	18
Apparent consumption*	582	566	589	530
Glass, including fibers	336	346	361.5	321.5
Chemicals	85	87	89	88.5
Pulping	49.5	18.5	22.5	21
Miscellaneous†	112.5	114.5	116	99

*Includes inventory changes.
†Including mining, smelting, detergents, cleaners, and water treatment.

SODIUM CARBONATE

UNITED STATES

Uses: Primary use of soda ash in the pulp and paper industry is in preparing sulfite liquor. Kraft mills also employ soda ash for makeup liquor. The largest application is by the glass industry followed by chemical manufacturing, detergents, and water treatment.

Demand: Pulp mill soda ash demand last year dropped to about 233,500 tons, off 6.5% from the 250,000 tons consumed in 1981. Glass industry use also dropped in 1982, to about 3.5 million tons from 3.8 million in 1981. Total demand was 6.7 million tons, compared to 7.15 million tons in 1981.

Sources: The six natural soda ash producers in the U.S. are: Tenneco, Allied, FMC, Stauffer Chemical, and Texasgulf in Wyoming. Kerr-McGee mines its trona in California. Allied operates the sole synthetic plant (Solvay process) in the U.S. at Syracuse, N.Y.

Availability: With entry of a fifth trona producer at Green River, U.S. capacity is near 11,000 tpy—more than enough for domestic demand for the next few years. 1982, market; 1981, market; 1980, market; 1979, market.

Pricing: In 1982, natural soda ash saw four price drops ($2/ton each), stabilizing at $84/ton in November. Synthetic sodium carbonate prices stayed at $132/ton throughout the year. Pricing history: natural, 1982, $92-$84/ton, f.o.b. Green River; 1981, $86-$92/ton; 1980, $76-$86/ton; 1979, $61-$66/ton; synthetic, 1982, $132/ton, f.o.b. Syracuse, N.Y.; 1981, $126-$132/ton; 1980, $113-$123/ton; 1979, $96-$101/ton.

Forecast: Pulp mill usage of soda ash in 1983 is predicted to increase between 1,000-2,000 tons. No price hikes are expected for the balance of 1983.

CANADA

Uses: Sulfite mills use sodium carbonate to prepare cooking liquor, while kraft mills use it to supplement caustic in their makeup liquor. Other end-uses include glass, chemicals, mining, detergents, and water treatment.

Demand: The demand from all end-users decreased in 1982, with pulp and paper use off only 6% to 7%, or an estimated 21,000 tons.

Sources: Allied Chemical is the only domestic producer and makes synthetic ash in Ontario. It supplies customers in western Canada with trona imported from its U.S. parent.

Availability: Canadian demand surpasses capacity, but U.S. imports make up the shortfall. 1982, market; 1981, market; 1980, market; 1979, market.

Pricing: Because of falling U.S. prices the price remained constant at $183/ton for bulk shipments, f.o.b. Amherstburg. Pricing history: 1982, $183/ton; 1981, $168-$183/ton; 1980, $145-$160/ton; 1979, $108-$128/ton.

Forecast: No price hikes are foreseen during 1983 due to the depressed markets in North America. Mill usage should increase slightly this year.

Mr. Shockett is consulting editor-chemical markets for Pulp & Paper.